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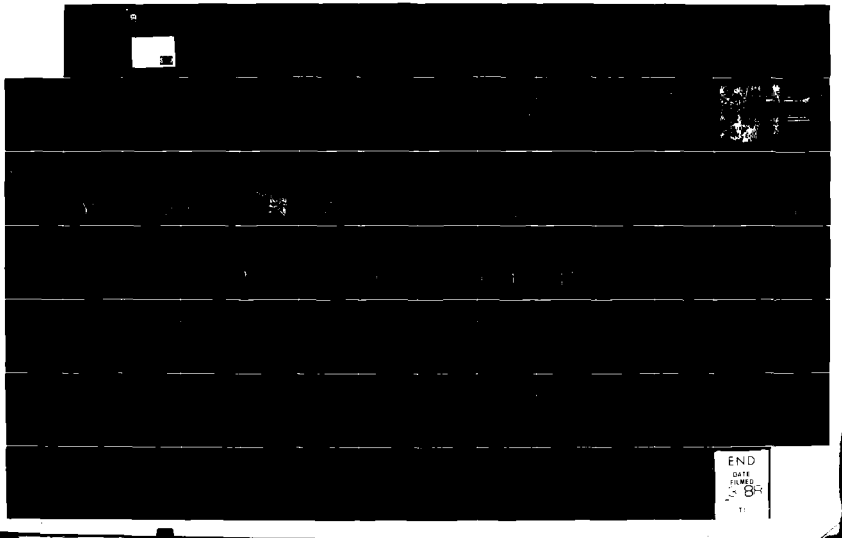

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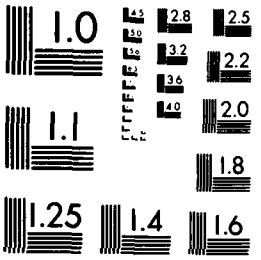
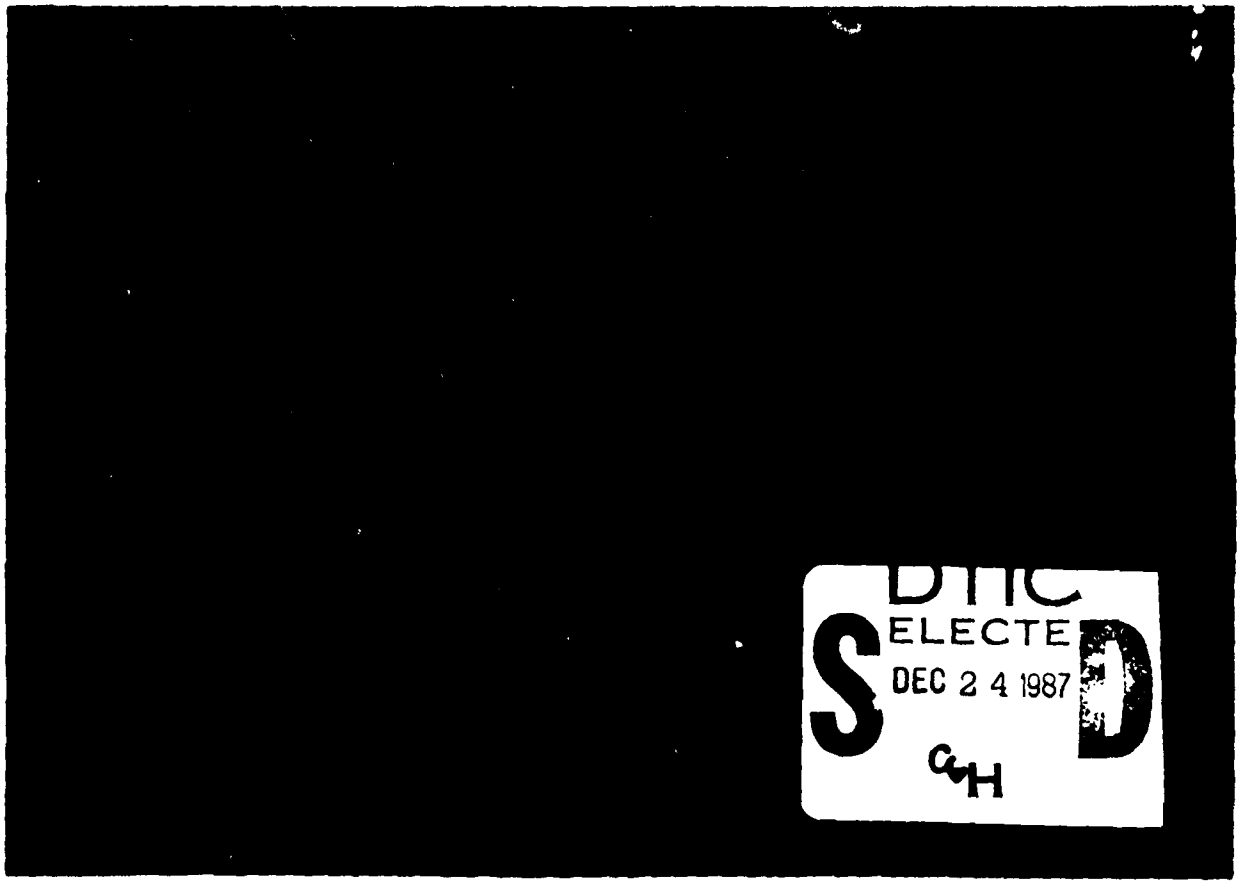


US Army Corps of Engineers
Fort Worth District

O.C. FISHER LAKE

FINAL FOUNDATION REPORT

EMBANKMENT - OUTLET WORKS - SPILLWAY



AUGUST 1987

CORPS OF ENGINEERS
FORT WORTH DISTRICT, TEXAS

FINAL FOUNDATION REPORT
O. C. FISHER LAKE
EMBANKMENT - SPILLWAY - OUTLET WORKS

- BY -

STEPHEN L. LACY

FORT WORTH, TEXAS
AUGUST 1987

TABLE OF CONTENTS

ILLUSTRATIONS

ILLUSTRATIONS
(cont'd)

O. C. FISHER DAM AND LAKE

1. **Project Location and Description.** The O. C. Fisher Dam and Lake project is located near San Angelo, Texas in central Tom Green County (see Plates 1 and 2). The dam is built on the North Concho River, approximately 7 miles upstream from its confluence with the Concho River. The dam controls a drainage area of about 1,511 mi^2. The principal features of the O. C. Fisher project include:

a. A rolled earthfill embankment approximately 40,119 feet long including the emergency spillway dike and having a maximum height of 120 feet above streambed.

b. An ogee-type uncontrolled spillway 1,825 feet long with a discharge capacity of 483,200 second feet at the design water surface elevation 1,960.0.

c. Outlet works comprising a gated intake structure, two 18.5-foot diameter conduits having a discharge capacity of 26,500 second feet at conservation pool elevation 1,908.0 and a stilling basin.

2. **Construction Authority.** Congressional authority for construction of the San Angelo Reservoir and Floodway is contained in the Flocd Control Act, approved 18 August 1941 (Public Law 228, 77th Congress, 1st Session), and Flood Control Act approved 22 December 1944 (Public Law 534, 78th Congress, 2d Session). San Angelo Reservoir was renamed O. C. Fisher Dam and Lake by Public Law 93-635 dated 3 January 1975.

3. **Purpose of Report.** This report has been prepared in accordance

with requirements as set forth by the Office, Chief of Engineers, and compiles data concerning the foundation characteristics, treatment, and preparation for the structues of the O. C. Fisher Dam project. A copy of this report should be included in the permanent records maintained at the project office.

4. **Contract.** Major contracts for construction of the project were as follows:

Contract No.	Title	Contractor	Date of Contract
W-41-243-ENG-1032	Portion of Embankment	Fuller Construction Company	7 May 1947
W-41-243-ENG-1062	Portion of Embankment	Hughes Construction Company	20 June 1947
W-41-243-ENG-1334	Construction of Outlet Works	Nolan Brothers, Incorporated	27 February 1948
W-41-243-ENG-1753	Completion of Embankment and Construction of Service Bridge and Spillway	Winston Brothers Company	22 March 1949

with requirements as set forth by the Office, Chief of Engineers. In 1983, the Corps of Engineers, Southwestern Division, requested that this report be prepared in order to compile data concerning the foundation characteristics, treatment and preparation for the various structures of the project. A copy of this report should be included in the permanent records maintained at the project office.

4. **Contract**. Major contracts for construction of the project were as follows:

Contract No.	Title	Contractor	Date of Contract
W-41-243-ENG-1032	Portion of Embankment	Fuller Construction Company	May 1947
W-41-243-ENG 1062	Portion of Embankment	Hughes Construction Company	20 June 1947
W-41-243-ENG-1334	Construction of Outlet Works	Nolan Brothers, Incorporated	27 February 1948
W-41-243-ENG-1753	Completion of Embankment and Construction of Service Bridge and Spillway	Winston Brothers Company	22 March 1949

Geology.

1. **Regional Geology and Physiography.** The O. C. Fisher Dam and Lake Project lies within the Central Texas section of the Great Plains physiographic province. It is encompassed on the south, west, and north by dissected remnants of the Edwards Plateau. The topography at the site is moderate to flat, formed by erosion of the nonresistant Permian strata and the reworking of the thick alluvial materials through which the North Concho River has cut its valley. The river floodplain is approximately 2,000 feet wide at the dam site. The left abutment rises very gradually away from the river. Two low terraces break the rise at 3,000 and 8,000 linear feet from the river edge. The right abutment rises abruptly from the floodplain and then grades into a gently rising slope. Vegetation on both abutments is moderate and consists of mesquite and oak.

2. **Geology of the Dam Site.**

a. **Overburden.** Alluvial materials overlying the primary material at the dam site vary in thickness between a few inches in the river bed to 82 feet on the left abutment. In the floodplain area, alluvial deposits range from 12 to 21 feet in thickness and consist chiefly of sandy or silty clay, caliche, sands, and gravels. The caliche deposits are intimately associated with the silt, clay, and gravel deposits by forming a weak cementing matrix between them.

The right abutment is covered by 10 to 20 feet of alternating soft and hard caliche which directly overlies Pleistocene conglomerate

deposits. A very thick soil mantle covers the left abutment. This 12- to 82-foot thick deposit consists of caliche, clay, sand, and gravel, and is locally cemented with a caliche or calcareous matrix, forming a soft conglomerate. The pervious strata in the alluvial deposits act as aquifers.

b. **Primary**. The primary formations at the dam site surface are of Permian age and were deposited near shore in a shallow fluctuating sea. As a result, these sedimentary beds often occur as tongues, lenses, or fans, and it is difficult to trace them over lateral distances. Strata of the San Angelo and Blaine Formations, Permian age, and the Trinity and Fredericksburg Group, Cretaceous age, outcrop in the O. C. Fisher reservoir area. The embankment is founded on the San Angelo Formation, whose beds dip beneath the Blaine strata 5 miles upstream from the dam site. Only the upper shale and sandstone beds of the San Angelo Formation are exposed in the 5-mile wide outcrop of the formation in the lower reservoir area. The Blaine Formation, consisting of alternating layers of shale, sandstone, limestone, and some gypsum seams unconformably overlie the San Angelo sediments. Underlying both of these units is the Chozo Formation consisting of 565 feet of red to green shale with some thin dolomitic limestone seams.

c. **Structure**. The Permian strata occurring in the project area have a general regional dip slightly north of west at a rate of 50 to 60 feet per mile. The beds strike northeast to southwest.

This normal westward dip of the Permian strata is broken only by minor structural features.

The oldest Permian strata outcrop is in eastern Tom Green County. Proceeding from southeast to northwest through the Concho and North Concho River watersheds, a successively younger series of Permian strata are revealed until they become buried under the Cretaceous overlap in northwestern Tom Green County. This feature is a result of the westward dip or tilting of the Permian beds and their consequent erosion. The Permian-Cretaceous contact is marked by a distinct erosional unconformity. No faulting is in evidence at the dam site. See Plate 3 for area geology map and sections.

d. **Ground Water**. In the river valley and right abutment, a perched semi-artesian aquifer is present in the Pleistocene basal conglomerates. Yields range from 3 to 4 gallons per minute to 400 gallons per minnute indicating not only a wide range of transmissibility in various portions of the aquifer, but also that the main body of the aquifer is not continuous, but lenticular with interconnections of submerged lenses of sand and gravel.

e. **Engineering Characteristics**. Overburden materials consisting of sand, silt, clays, and some gravels are located along the axis of the embankment. They were found to have the average engineering characteristics:

Liquid Limit 36

Plasticity Index 20

Moisture Content 11

Natural Dry Density 80-97 pcf

Undisturbed samples of the foundation soils were secured from two core borings and three test pits. Direct shear tests were run on five samples from the two core borings. Values of $\emptyset$ averaged 23.3° and cohesion averages ran 0.2 tons per ft^2. These tests are representative of the silty and clayey soils in the floodplain.

Bedrock strata of the San Angelo Formation which comprise the foundation medium for the embankment and appurtenant structures exhibit the following characteristics:

Bedrock Type	Natural Dry Density	Natural Moisture Content	Unconfined Compressive Strengths
Shale	111.4 to 136.0 pcf	2.9 to 15.0%	0.9 to 50.6 TSF
Sandstone	- -	- -	0.4 to 3.3 TSF

Explorations.

Geological investigations were initiated at the O. C. Fisher Dam site in 1938 with the drilling of four 2-inch core holes. During 1939, another 112 earth auger borings were completed in the general area of the dam site. An extensive investigation was started in 1943 and completed in 1945. This investigation included the drilling of 161 2-inch, and 13 6-inch borings to determine bedrock elevations, the nature of foundation rocks, and their stratigraphic and structural conditions. Water pressure tests were conducted in seven 2-inch core borings. One 30-inch boring was made on the right abutment for insitu visual inspection of the foundation rocks. Other soil investigations continued from 1943 to 1945 and included more than 400 auger borings in the proposed borrow areas. Additional borings were completed along the axis of the dam site. The types of borings made included fishtail borings, Denison samples, and test pits. See Plates 4-15 for boring location plans and logs of borings.

Character of Foundations.

1. **Embankment.** The embankment is situated in an area where resistant Pleistocene conglomerates form a high bluff along the right boundary of the river valley and where the thickest and most massive of the San Angelo Sandstones would form a foundation for the main embankment section.

Sandstone strata of the San Angelo Formation are overlain by 14 feet of sand, silt, and clay on the left bank of the river. At a point 2,000 feet north of the river (approximate embankment Station 249+00) these alluvial deposits have thickened to 25 feet where a shale member of the San Angelo Formation underlies the alluvial deposits. From this point to the north end of the dam axis, the alluvial deposits range from 25 to 82 feet in thickness and are underlain by relatively compact and impervious shale beds. A conglomeritic layer occurs on top of these shale beds and ranges from a few feet to 42 feet in thickness. Cementation in this bed is variable and irregular, portions of it occurring as sand and gravel whereas other portions are very firmly cemented.

Alluvial deposits are approximately 19 feet thick on the right side of the river and overlie sandstones of the San Angelo Formation to a point 1,200 feet south of the river (approximate embankment station 204+00) where shale strata underlie the alluvial deposits for a distance of approximately 450 feet. At this point, the shales are overlapped by conglomeritic beds. These beds underlie the 10-

to 20-foot alluvial blanket to the south end of the dam axis; are variably solutioned and irregularly cemented, and range from 15 to 30 feet in thickness. A grout curtain was constructed in this unit from Station 178+00 to Station 208+00 during the early 1960's.

The embankment foundation construction included an inspection trench excavated to or into the conglomerate from approximate Stations 175+50 to 208+00 on the south abutment. On the north abutment an inspection trench was excavated to a minimum of 10 feet and a maximum of 20 feet between approximate Stations 208+00 to 249+00. A toe drain and trench were constructed between Station 198+00 and 215+00 and between Stations 237+00 and 310+00. See Plates 16-21 for embankment plan and sections.

2. **Outlet Works**. Core borings drilled in the area underlying the outlet works indicated that the site contains a 25-foot stratum of massive, well-cemented sandstone of the San Angelo Formation. The sandstone is generally uniform in thickness and is mantled by a 15- to 20-foot alluvial deposit. The sandstone unit which forms the foundation of the outlet works was found to be structurally sound.

3. **Spillway**. The spillway is located approximately 4,000 feet west of the south end of the dam axis. Core borings indicate the foundation material to be shale beds of the San Angelo Formation. The shale is impervious and structurally sound, but will slake down and erode rapidly if subjected to stream scour in the approach and

discharge channels. Alluvial materials overlying the shale beds range from 6 to 15 feet in thickness and are pervious to water movement. See Plates 22-24 for the Embankment, Spillway, and Outlet Work structures plan and sections.

Foundation Treatment

1. **Foundation Grouting**. A grouting program was conducted intermittently from June 1960 to July 1963 placing a single line grout curtain within the conglomerate between embankment Stations 172+00 and 208+00 and 10 feet upstream of centerline. The initial spacing of the grout holes varied along the dam axis depending on the "tightness" of the conglomerate material and time restrictions. From Stations 172+00 to 183+00, an initial spacing of 40-foot centers was drilled. Between embankment Stations 183+20 to 186+00, a 20-foot initial spacing was used which varied from a 10- to 20-foot spacing from Station 186+00 to 195+80. In areas where large grout takes were found, secondary and tertiary holes were drilled on 10- and 5-foot centers. The main area of activity for the secondary and tertiary holes was from Stations 186+00 to 195+80. Beginning at Station 195+80 to Station 208+00, 200-foot centers were drilled. Secondary centers were drilled with a spacing of 20 feet although most of the holes were found to be tight.

a. **Initial Foundation Grouting**. The grout holes were drilled in one stage from the upstream edge of the roadway on top of the dam and projecting upstream at a 10° angle from the vertical. The bottom of the hole generally projected 3 to 5 feet into the underlying shale unit. Approximately 70 to 75 feet of each hole was cased through the embankment to prevent caving and to prohibit water and grout from acting on the embankment material. All foundation

materials were tight except for the solutioned zones within the conglomerate. Air expanded, single packers confined grout access to the zone of leakage and the top 3' to 5' of the underlying shale. Frequent difficulty was encountered during pressure testing and grouting due to packer failures while expanding into open joints. Grouting refusal pressures were established at 50 to 60 psi. Neat cement was used in w/c ratios from 4.0 to 0.8, with 1.0 being the most frequently used mix. Neat mixes without additives could not be pumped thicker than 0.8 w/c. Mixes were thickened as needed by using Sika Chemical Interplast "C" in the amount of 1 percent of the cement content.

The areas of highest grout take were located from Stations 181+00 to 192+50. Seepage through the conglomerate zone beneath the embankment appears to be critically related to the elevation of the reservoir. A reservoir elevation above 1900 to 1903 feet appears to be critical for seepage flows.

b. **Continued Foundation Grouting**. A second grouting program was conducted within the conglomerate zone in 1980 which extended the right abutment curtain from embankment Station 150+00 to 180+00. A total of 130 vertical holes were drilled with hole spacing of 10 to 40 feet along the upstream toe of the embankment. Hydraulic pressure tests confirmed that the conglomerate along this section was mostly tight. See Plates 25 through 34 for detailed plan and profile of the foundation grout curtain.

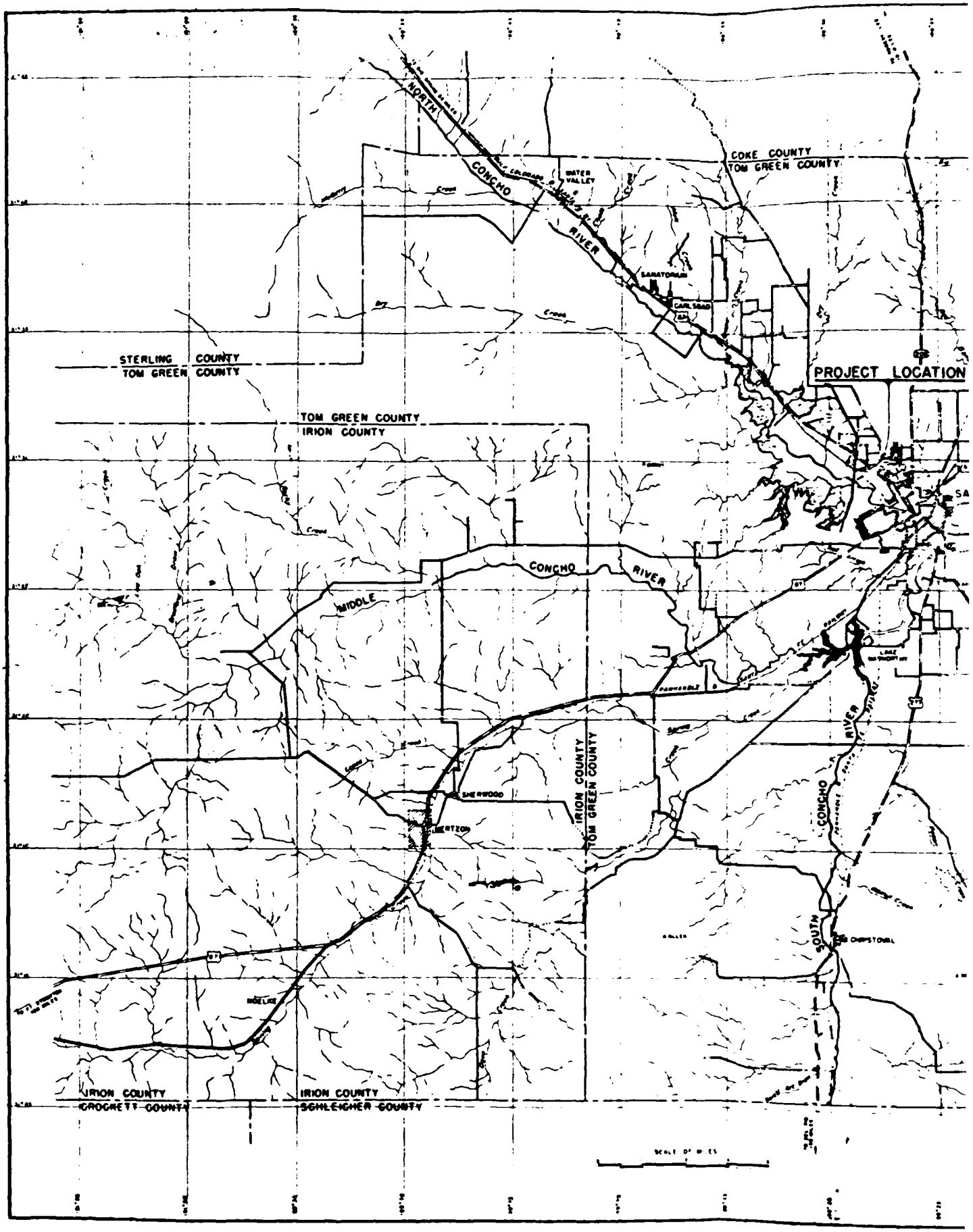
2. **Drainage Provisions**. A toe drain located in the foundation inside the downstream slope of the embankment consists of a 12-inch diameter perforated pipe embedded in gravel with intermittent manholes. The toe drain extends between Stations 198+00 and 215+00 and between Stations 227+00 and 310+00.

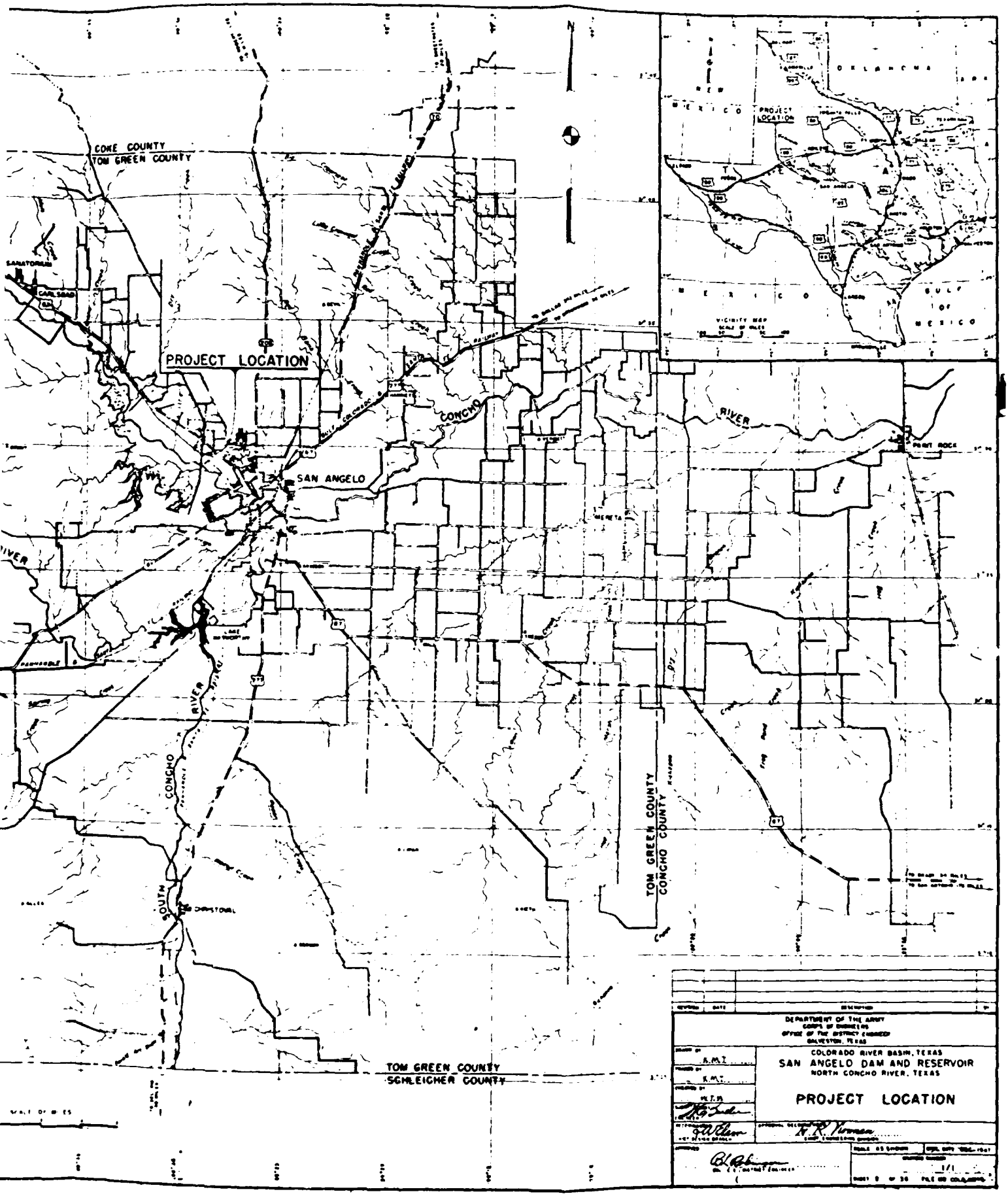
3. **Relief Wells in Spillway**. In the summer of 1977, 110 pressure relief wells were drilled at an angle of 30° from the vertical and with a total length of hole reaching 52 feet under the weir from Station 100+34 to a point intersecting a vertical plane through Station 100+20. The holes were centered at a distance of 10 feet apart across the full width of the weir monolith to provide the necessary drainage relief to the revised weir monolith stability design. See Plate 35 for a typical relief well diagram.

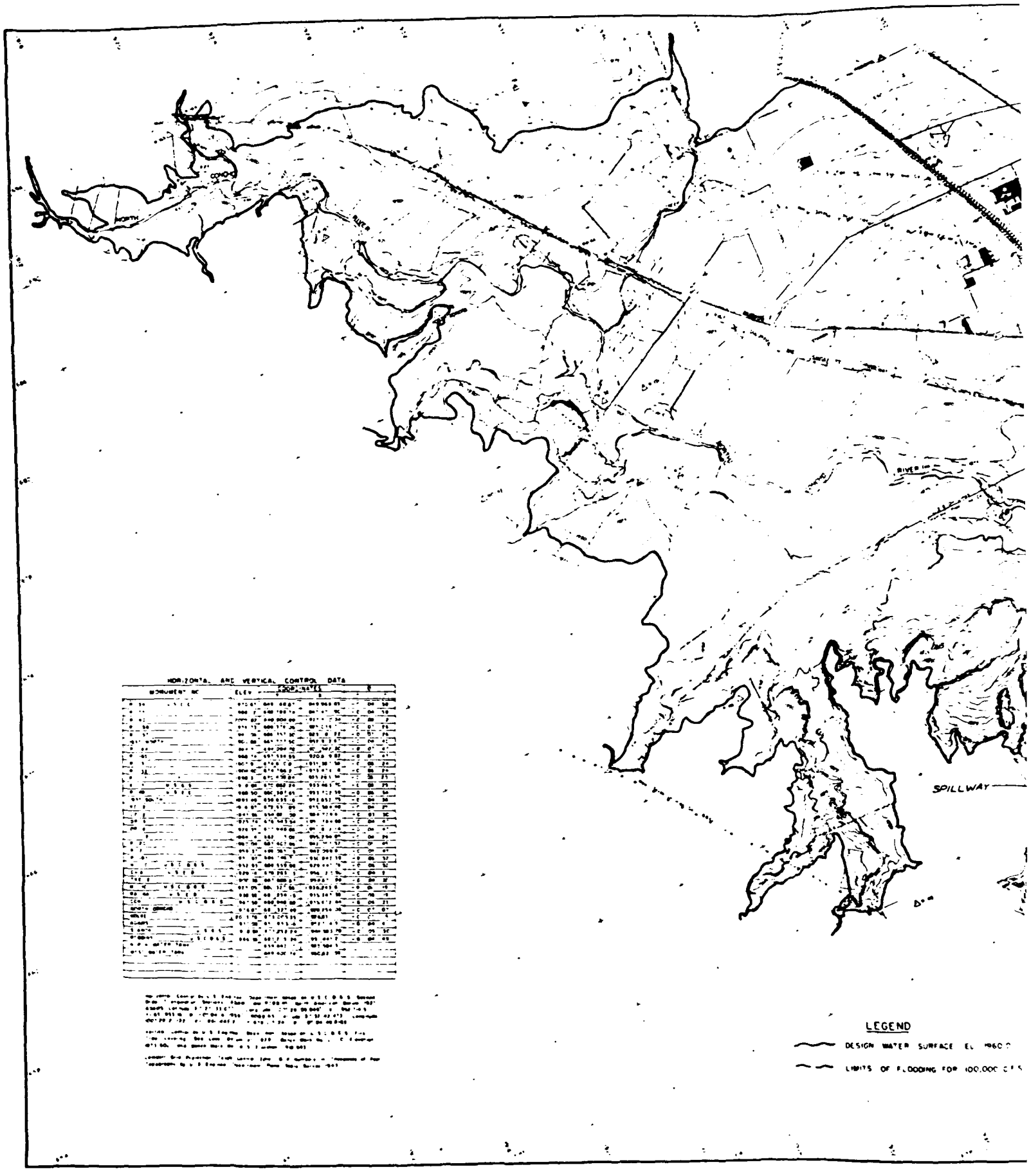
Foundation Instrumentation

Embankment and Embankment Foundation. No instrumentation was installed in the embankment or in the embankment foundation during construction of the dam. During the seepage investigation and grouting programs of 1958 and 1963, 51 ground-water observation wells were installed in the embankment foundation and downstream from the embankment.

During November 1974, six permanent additional ground-water observation wells were installed between the government property line and the North Concho River to better define any reservoir leakage. Fifteen wells are currently being monitored along the embankment. These wells are numbered 3, 7, 8, 10, 15, 25, 28-30, and 639-644. See Plates 36 and 37 for the boring layout of selected observation wells and water table elevations.


NORTH CONCHO RIVER
COKE COUNTY
TOM GREEN COUNTY
WATER VALLEY
SANATORIUM
CARLSBAD
STERLING COUNTY
TOM GREEN COUNTY
PROJECT LOCATION
TOM GREEN COUNTY
IRION COUNTY
CONCHO RIVER
MIDDLE
SHERWOOD
IRION COUNTY
TOM GREEN COUNTY
CONCHO RIVER
SOUTH
CHRISTOVAL
IRION COUNTY
CROCKETT COUNTY
IRION COUNTY
SCHLEICHER COUNTY


COKE COUNTY
TOM GREEN COUNTY
PROJECT LOCATION
SAN ANGELO
CONCHO RIVER
SOUTH CONCHO RIVER
TOM GREEN COUNTY
CONCHO COUNTY
SCHLEICHER COUNTY
PRINT ROCK
OKLAHOMA
MEXICO
GULF OF MEXICO
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
OFFICE OF THE DISTRICT ENGINEER
GALVESTON, TEXAS
COLORADO RIVER BASIN, TEXAS
SAN ANGELO DAM AND RESERVOIR
NORTH CONCHO RIVER, TEXAS
PROJECT LOCATION



HORIZONTAL AND VERTICAL CONTROL DATA

LEGEND

DESIGN WATER SURFACE EL

LIMITS OF FLOODING FOR 100,000 CFS

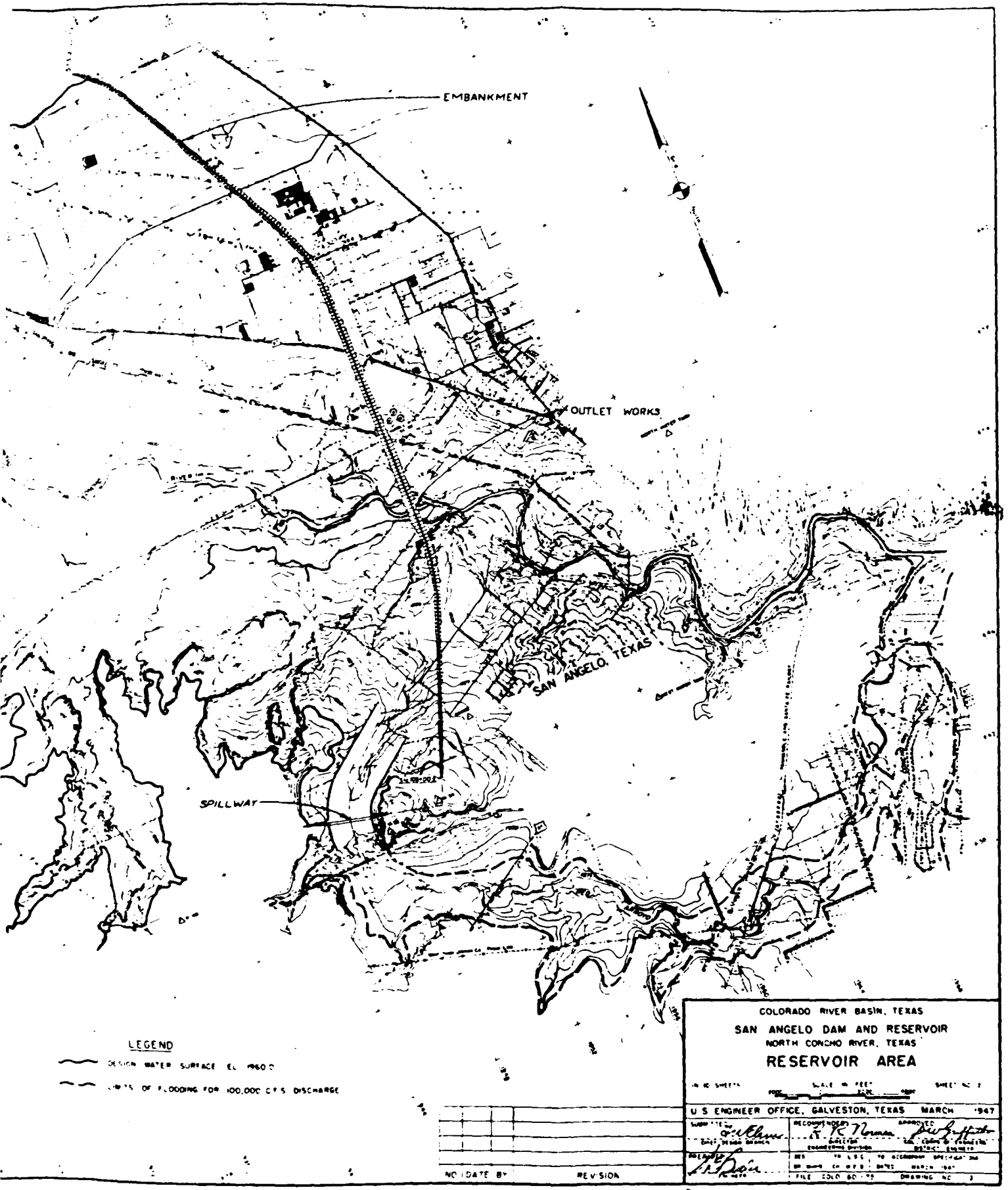
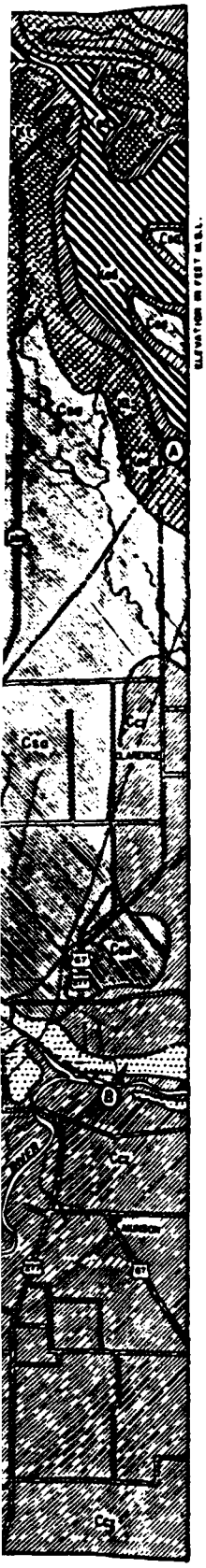
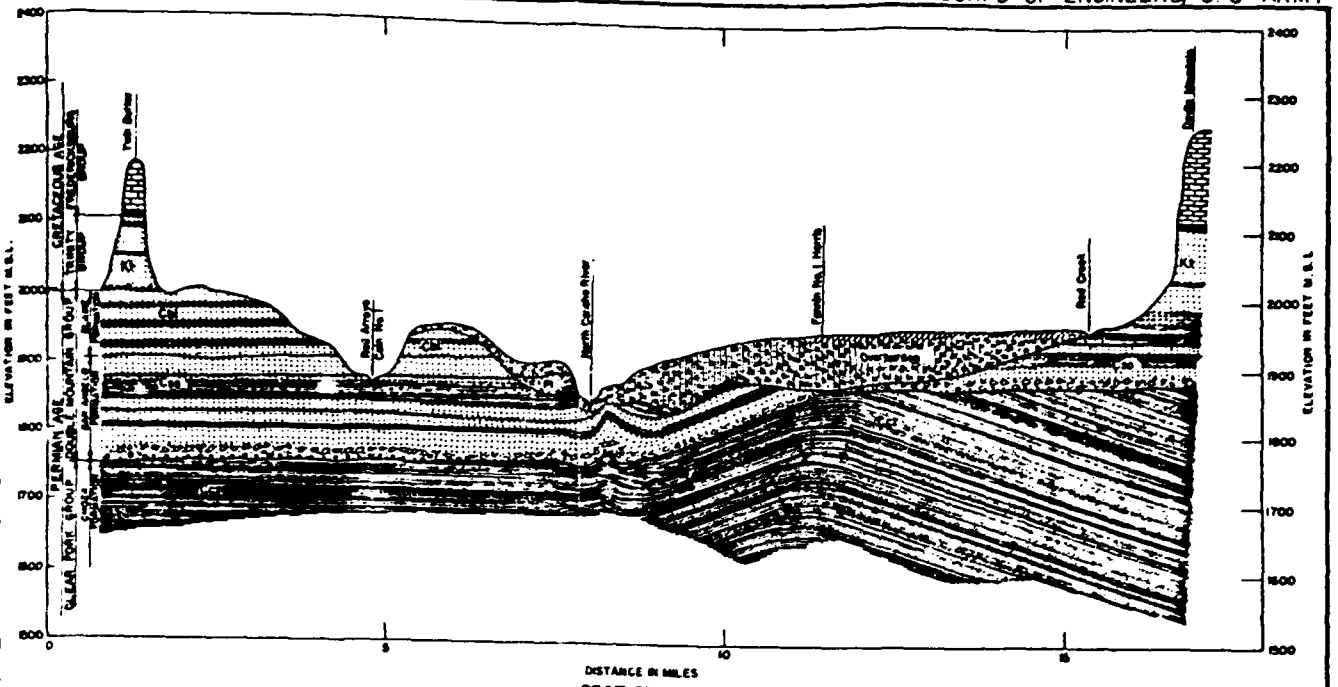

EMBANKMENT
OUTLET WORKS
SAN ANGELO, TEXAS
SPILLWAY
LEGEND
DESIGN WATER SURFACE EL 1960.0
LIMITS OF FLOODING FOR 100,000 C.F.S. DISCHARGE
NO. DATE BY REVISION
COLORADO RIVER BASIN, TEXAS
SAN ANGELO DAM AND RESERVOIR
NORTH CONCHO RIVER, TEXAS
RESERVOIR AREA
SCALE IN FEET
U.S. ENGINEER OFFICE, GALVESTON, TEXAS MARCH 1947
RECOMMENDED
APPROVED
DIVISION ENGINEER
DISTRICT ENGINEER
FILE COLO 60-93
DRAWING NO. 3

PLATE 2

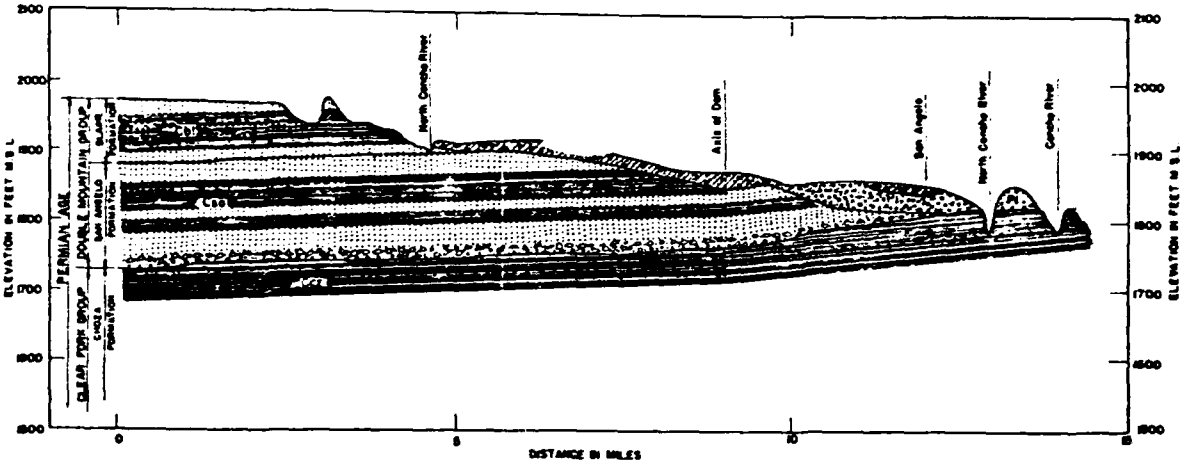
WAR DEPARTMENT

AREAL GEOLOGY





SECTION A-A



SECTION B-B

LEGEND

QUATERNARY

Pc PLEISTOCENE CONGLOMERATE

CRETACEOUS

FREDERICKSBURG GROUP

Kgd EDWARDS FORMATION

Kgm COMANCHE PEAK - WALNUT FORMATIONS

TRINITY GROUP

Kt (UNDIFFERENTIATED)

PERMIAN

DOUBLE MOUNTAIN GROUP

Cbl BLAINE FORMATION

Csa SAN ANGELO FORMATION

CLEAR FORK GROUP

Ccz CHOZA FORMATION

COLORADO RIVER BASIN, TEXAS

SAN ANGELO RESERVOIR

NORTH CONCHO RIVER, TEXAS

AREAL GEOLOGY AND REGIONAL GEOLOGIC SECTIONS

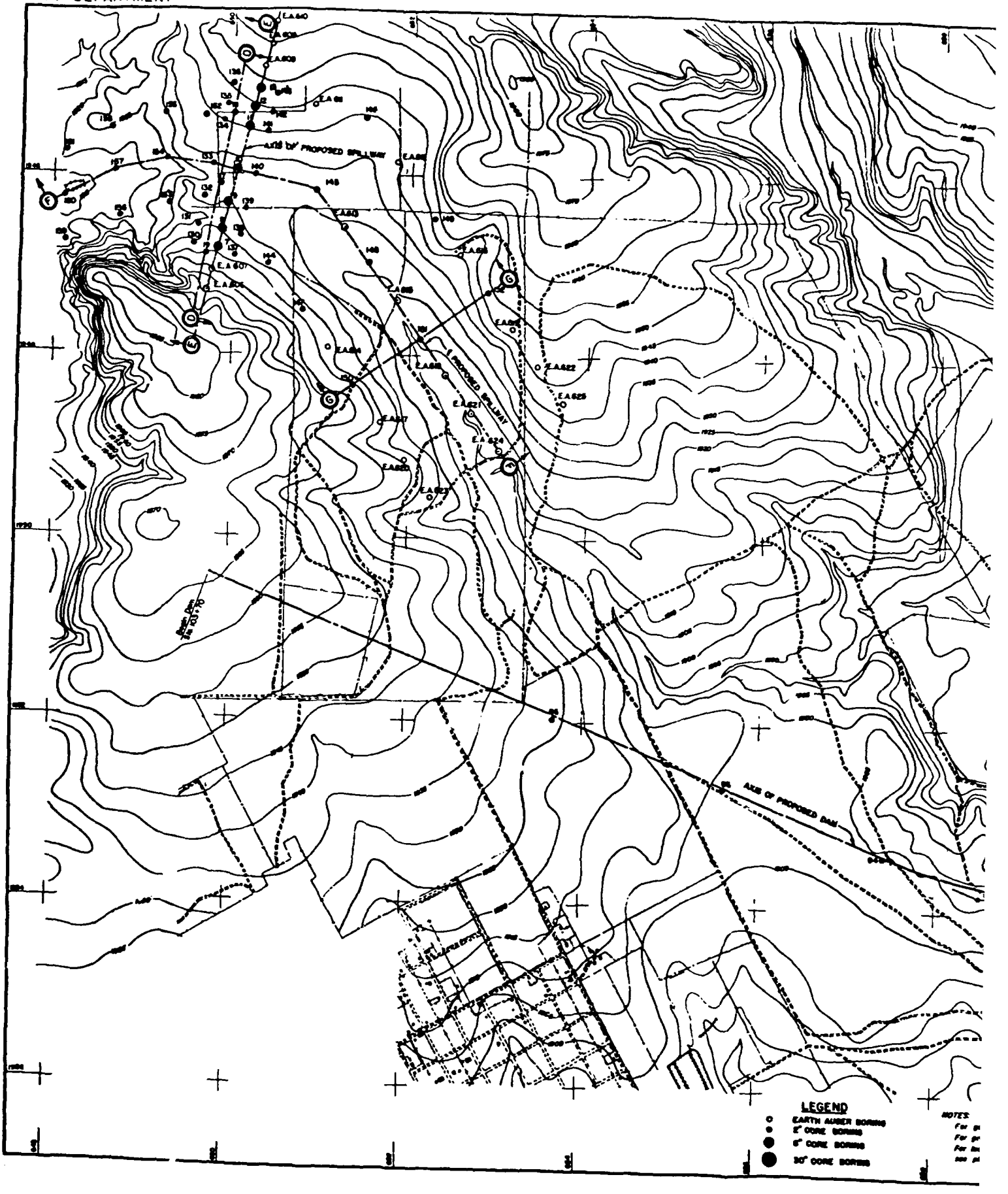
IN 15 SHEETS SCALES AS SHOWN SHEET NO 1

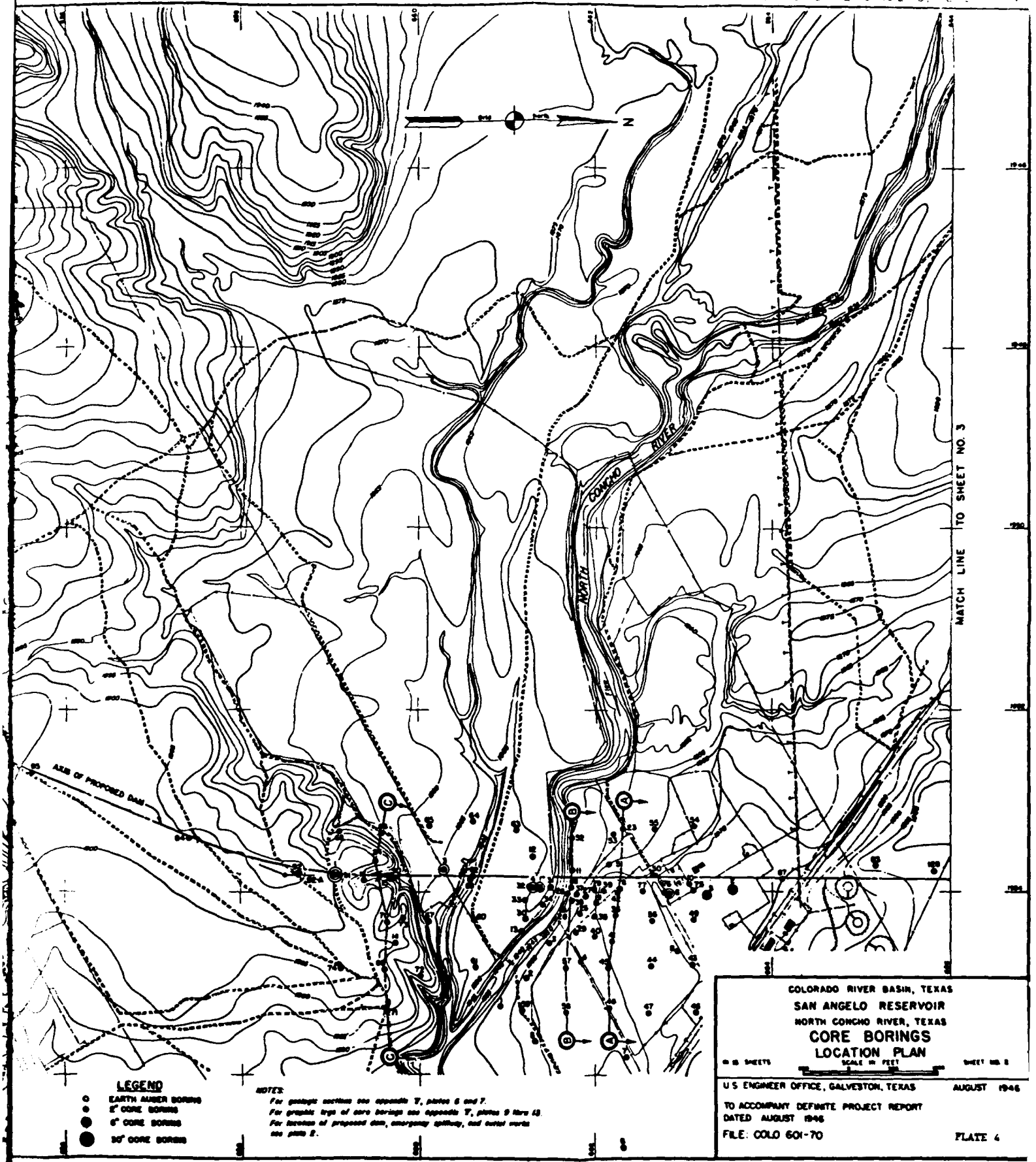
U S ENGINEER OFFICE, GALVESTON, TEXAS AUGUST 1946

TO ACCOMPANY DEFINITE PROJECT REPORT DATED AUGUST 1946

FILE COLO 601-70 PLATE 3

WAR DEPARTMENT





COLORADO RIVER BASIN, TEXAS

SAN ANGELO RESERVOIR

NORTH CONCHO RIVER, TEXAS

CORE BORINGS LOCATION PLAN

SCALE IN FEET

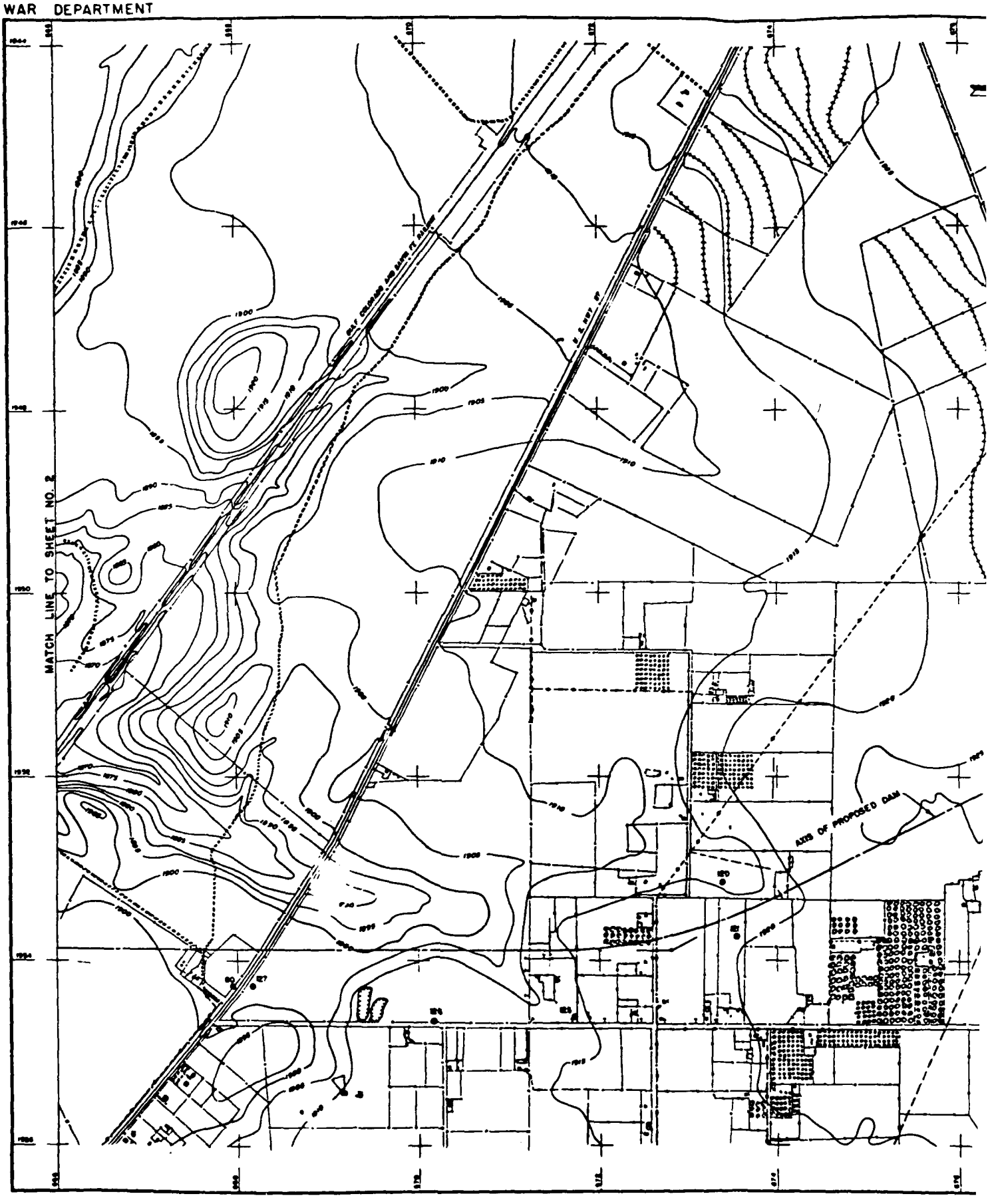
U S ENGINEER OFFICE, GALVESTON, TEXAS AUGUST 1946

TO ACCOMPANY DEFINITE PROJECT REPORT DATED AUGUST 1946

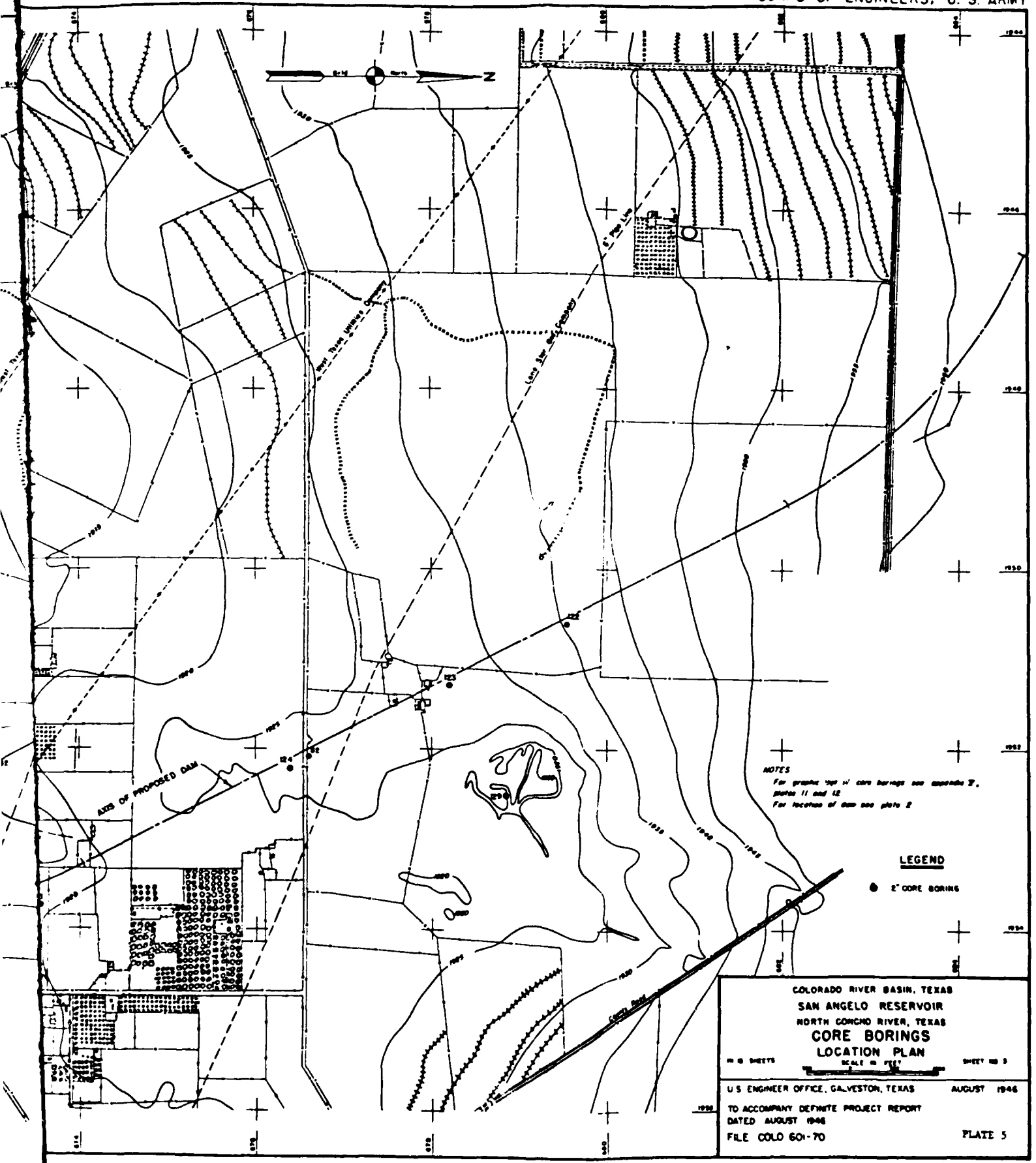
FILE: COLO 601-70

PLATE 4

WAR DEPARTMENT



CORPS OF ENGINEERS, U. S. ARMY



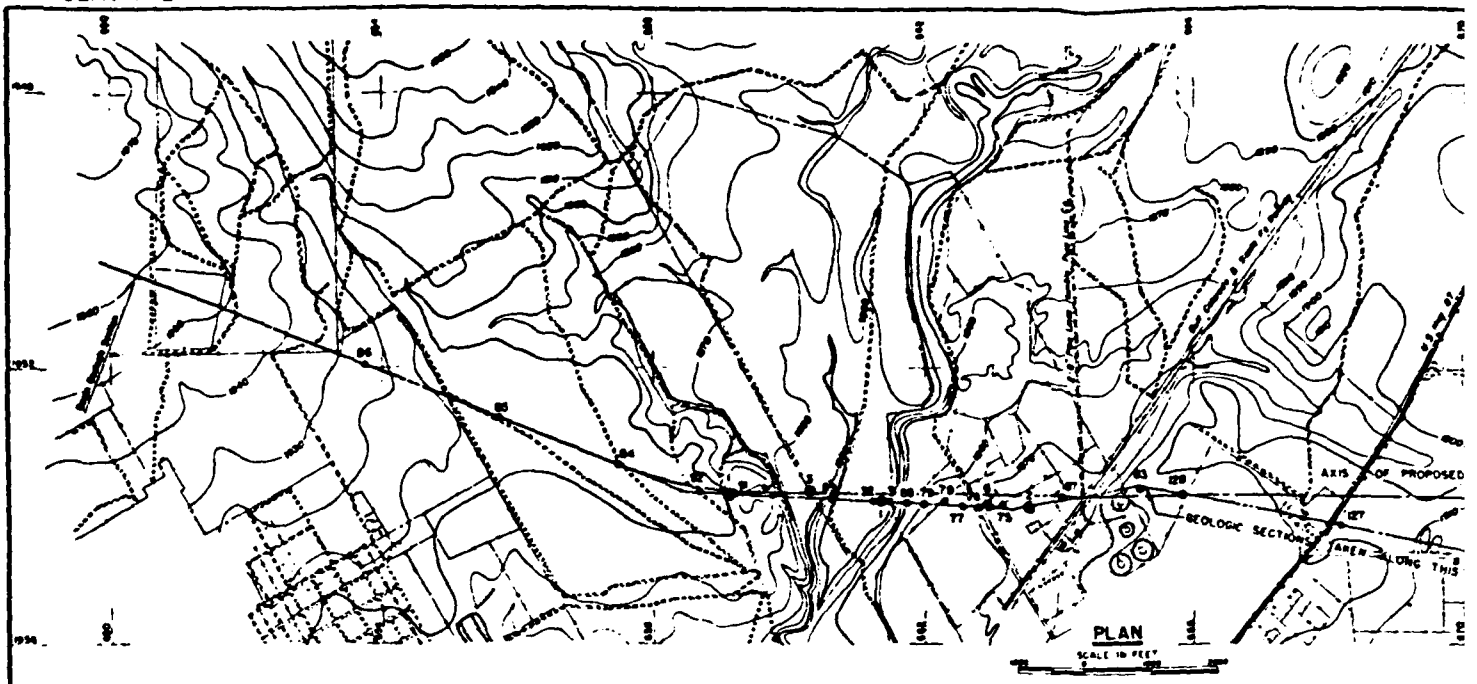
COLORADO RIVER BASIN, TEXAS
SAN ANGELO RESERVOIR
NORTH CONCHO RIVER, TEXAS
CORE BORINGS
LOCATION PLAN

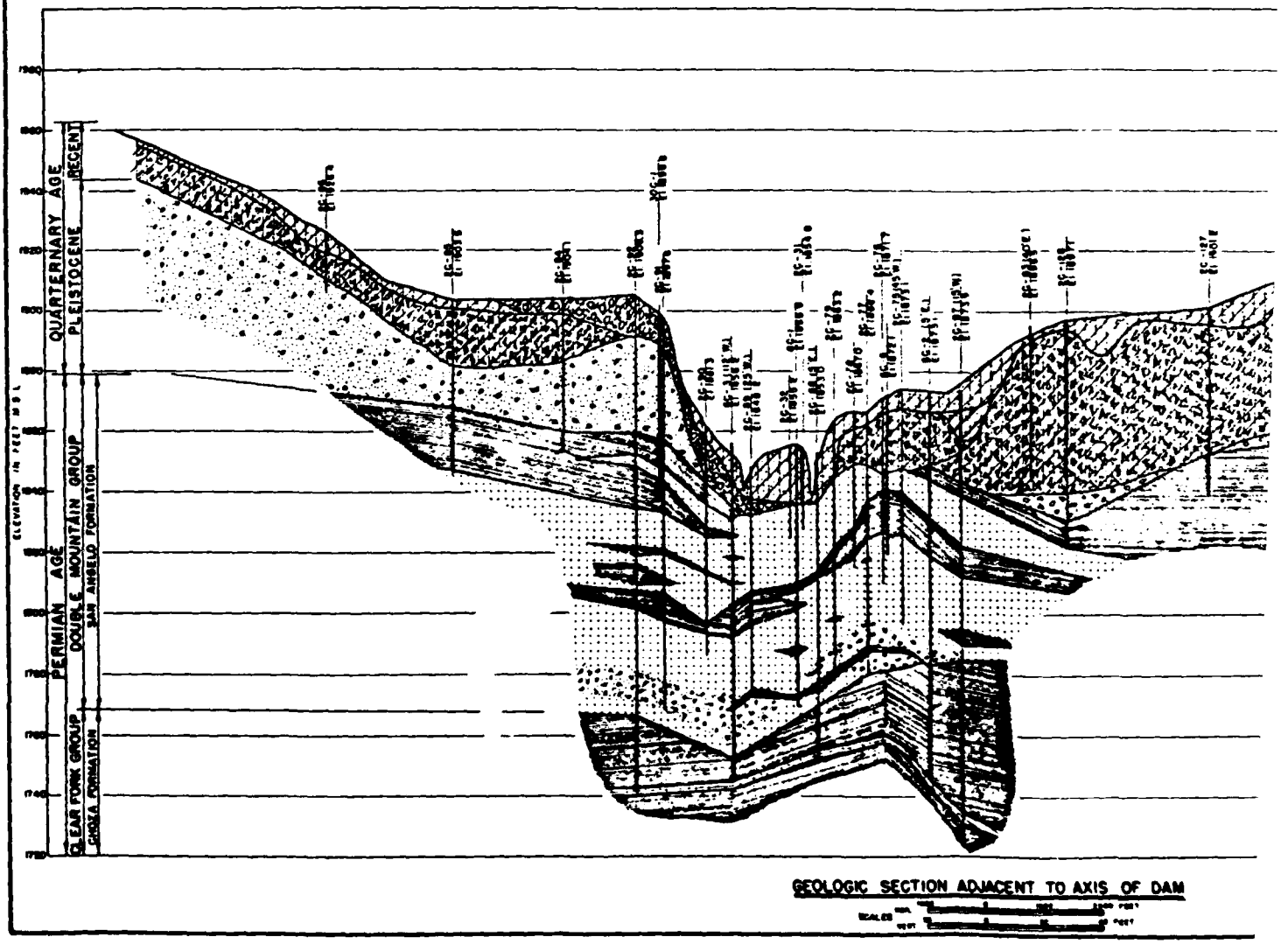
U.S. ENGINEER OFFICE, GALVESTON, TEXAS AUGUST 1946

TO ACCOMPANY DEFINITE PROJECT REPORT
DATED AUGUST 1946

FILE COLO 601-70 PLATE 5

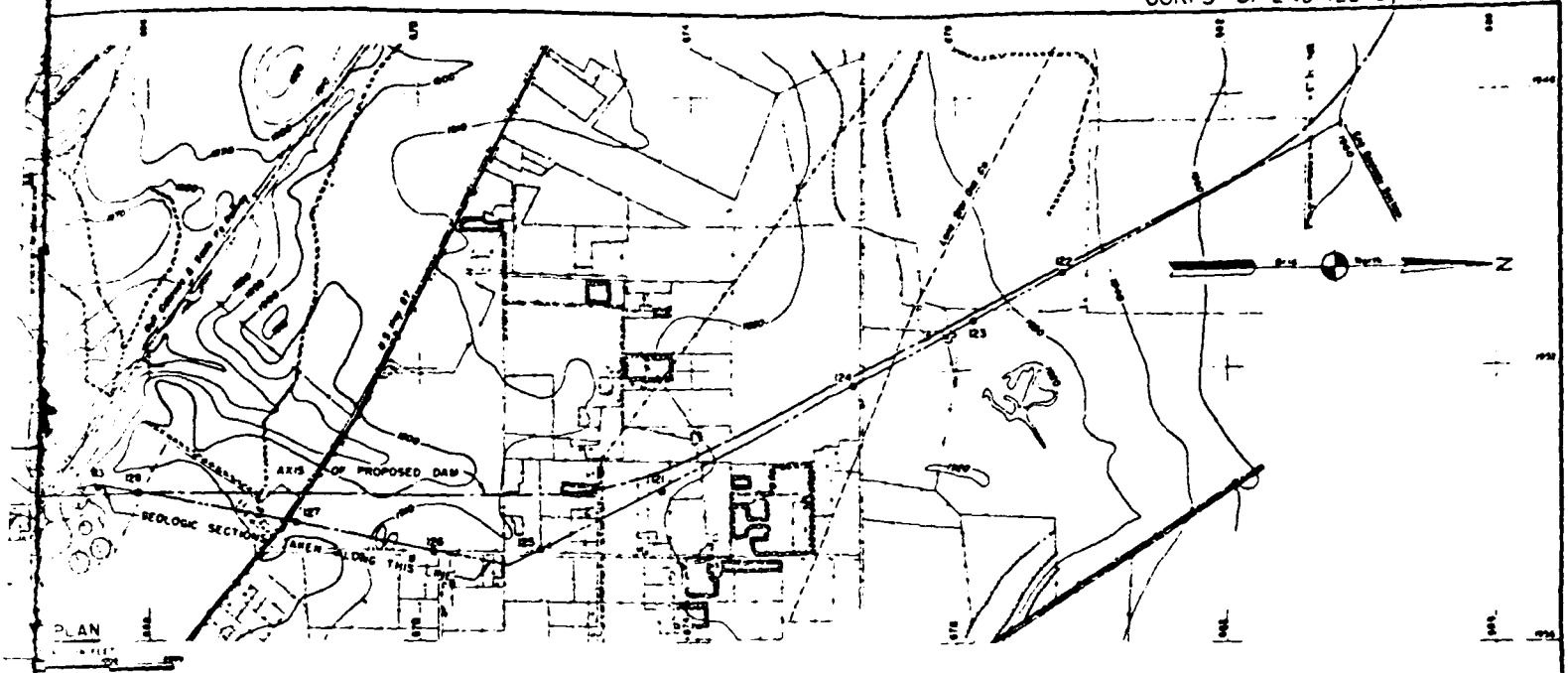
WAR DEPARTMENT

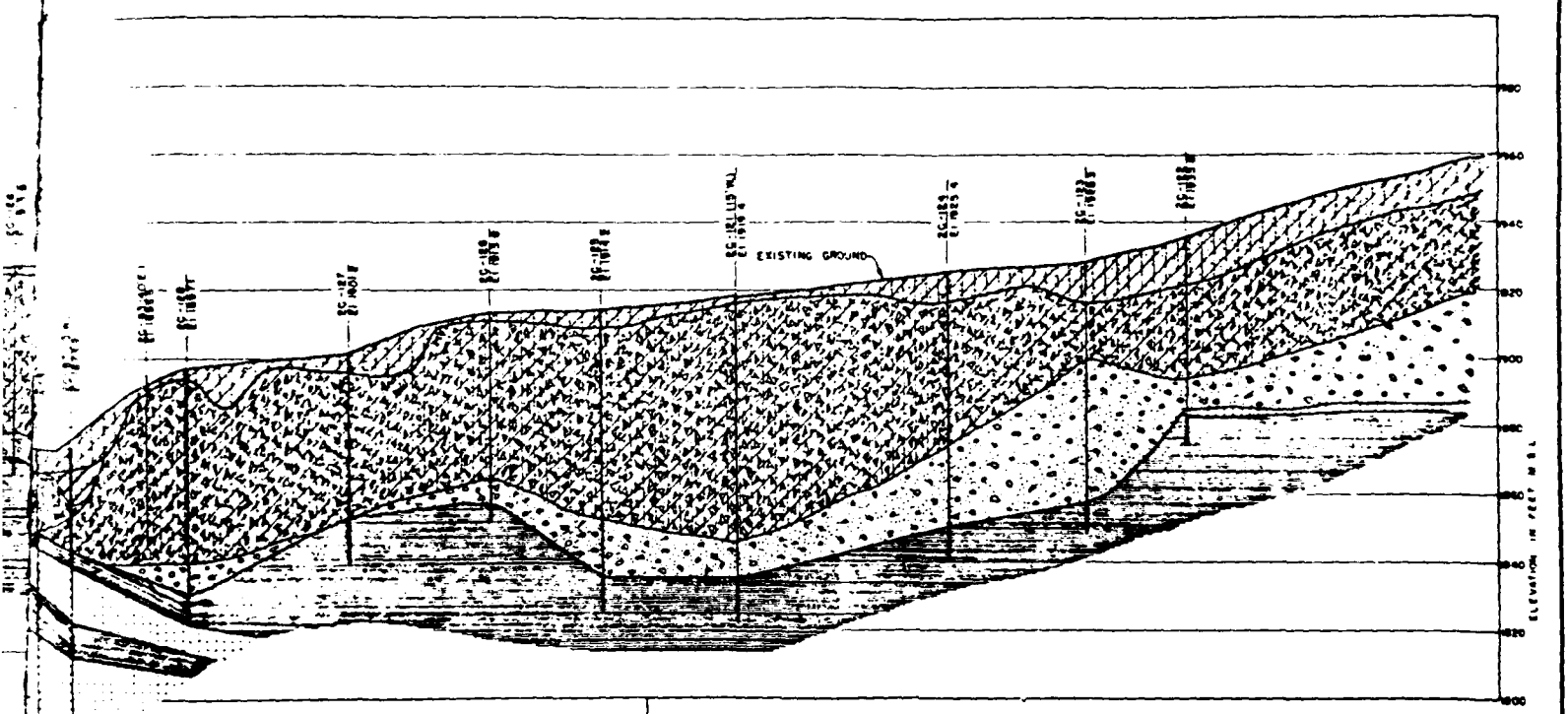


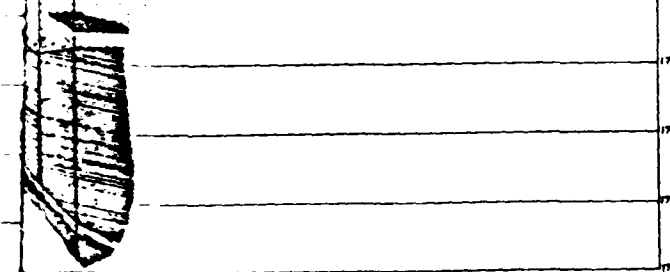


GEOLOGIC SECTION ADJACENT TO AXIS OF DAM

CORPS OF ENGINEERS, U S ARMY







ION ADJACENT TO AXIS OF DAM

LEGEND

SAND | SILT | CLAY | GRAVEL

SHALE | LIMESTONE | SANDSTONE | CONGLOMERATE

2" CORE BORING

6" CORE BORING

30" CORE BORING

CALICHE

NOTE

For graphic logs of core borings see appendix V, plates 9 thru 13.

COLORADO RIVER BASIN, TEXAS

SAN ANGELO RESERVOIR

NORTH CONCHO RIVER, TEXAS

CORE BORINGS

PLAN AND GEOLOGIC SECTION

IN 15 SHEETS SHEET NO 6

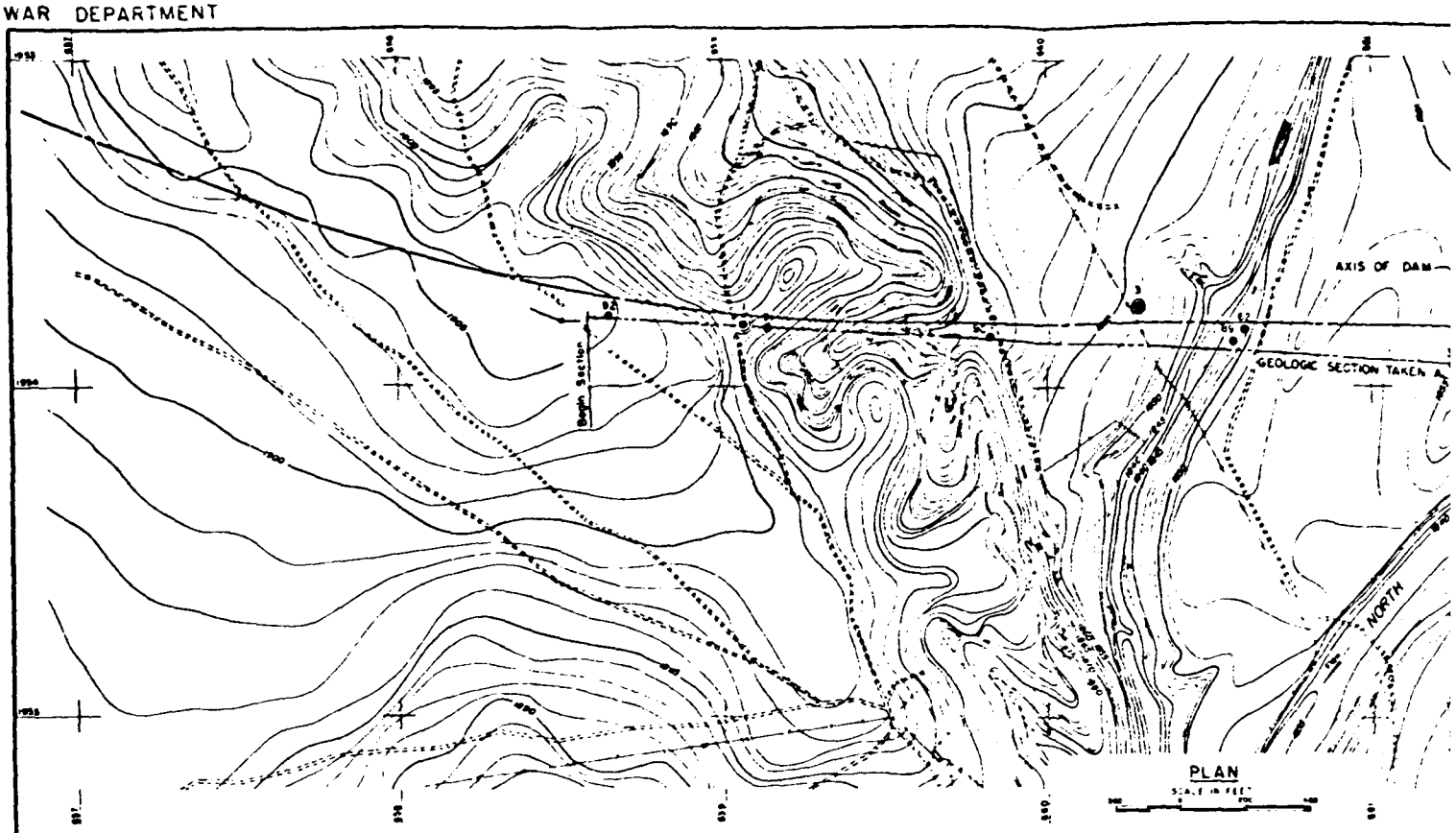
SCALES AS SHOWN

U.S. ENGINEER OFFICE, GALVESTON, TEXAS AUGUST 1946

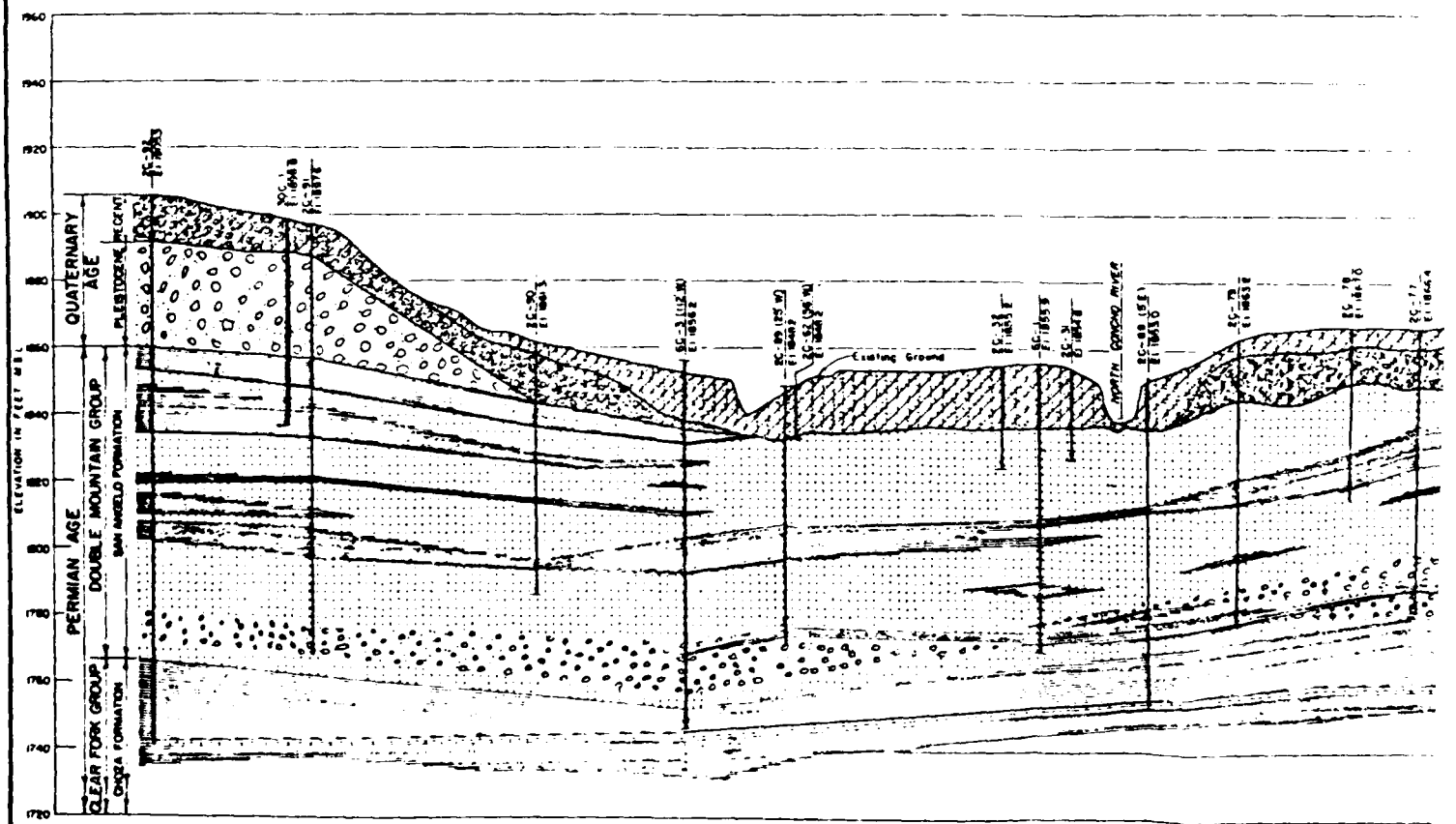
TO ACCOMPANY DEFINITE PROJECT REPORT DATED AUGUST 1946

FILE COLO 601-70 PLATE 6

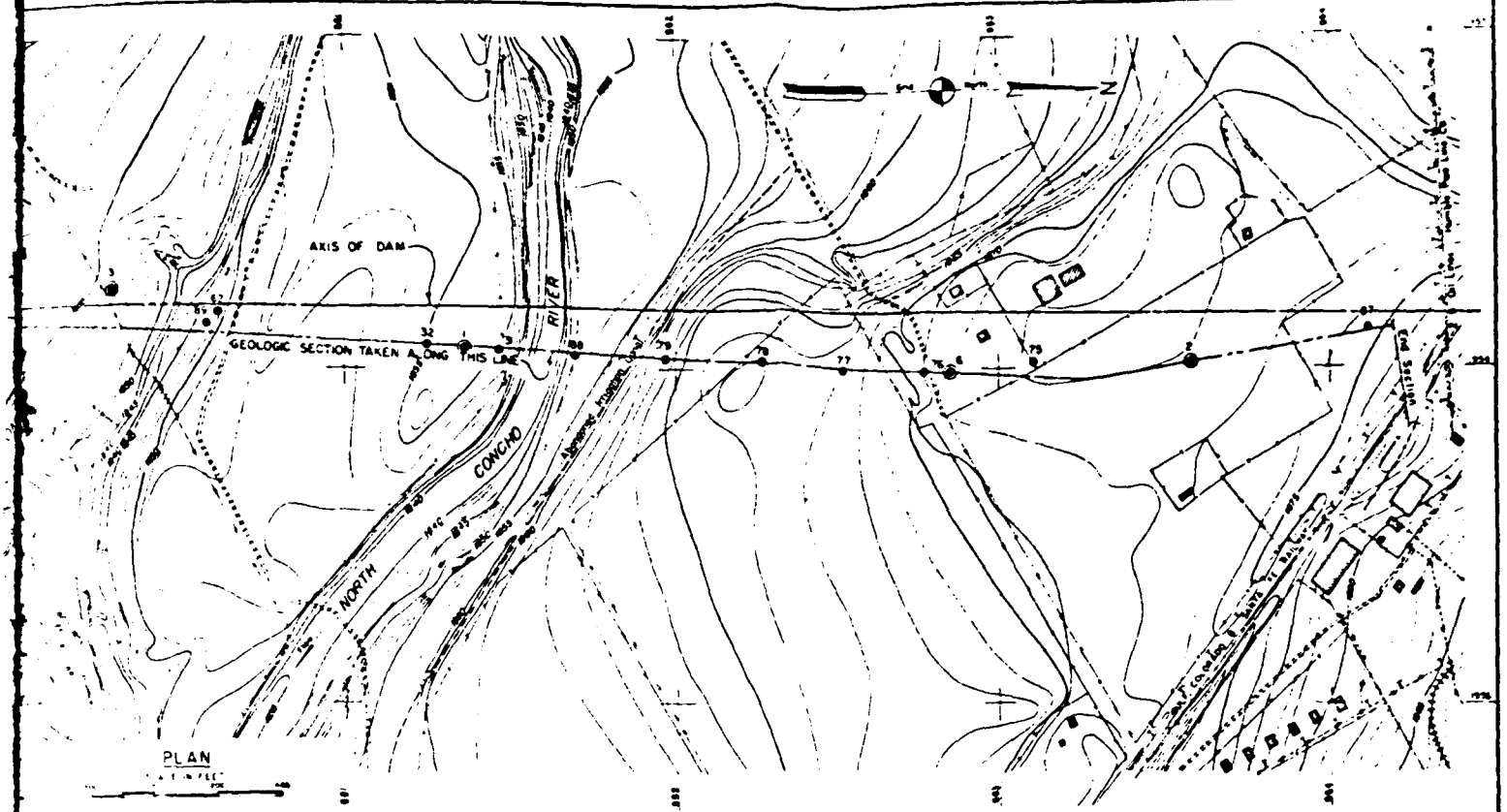
WAR DEPARTMENT

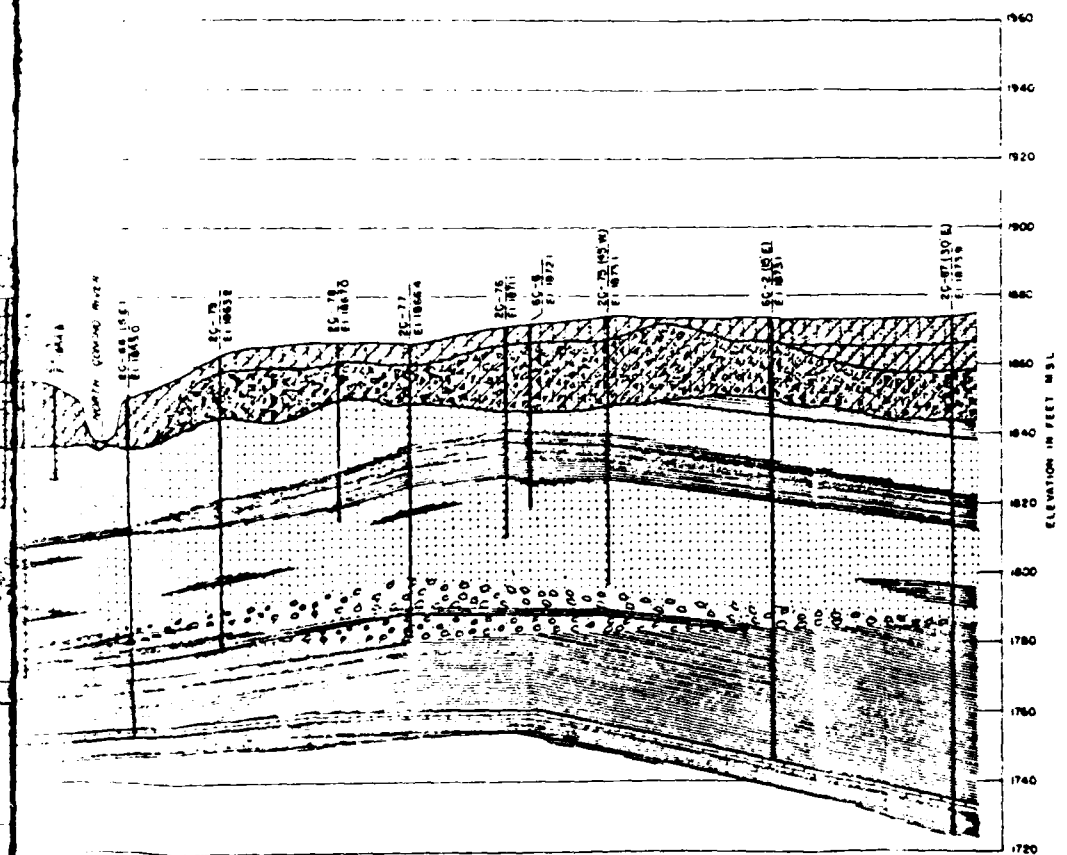


PLAN



GEOLOGIC SECTION ADJACENT TO AXIS OF DAM





SECTION ADJACENT TO AXIS OF DAM

NOTE:
For graphic logs of core borings see Appendix II, plate 9 this set

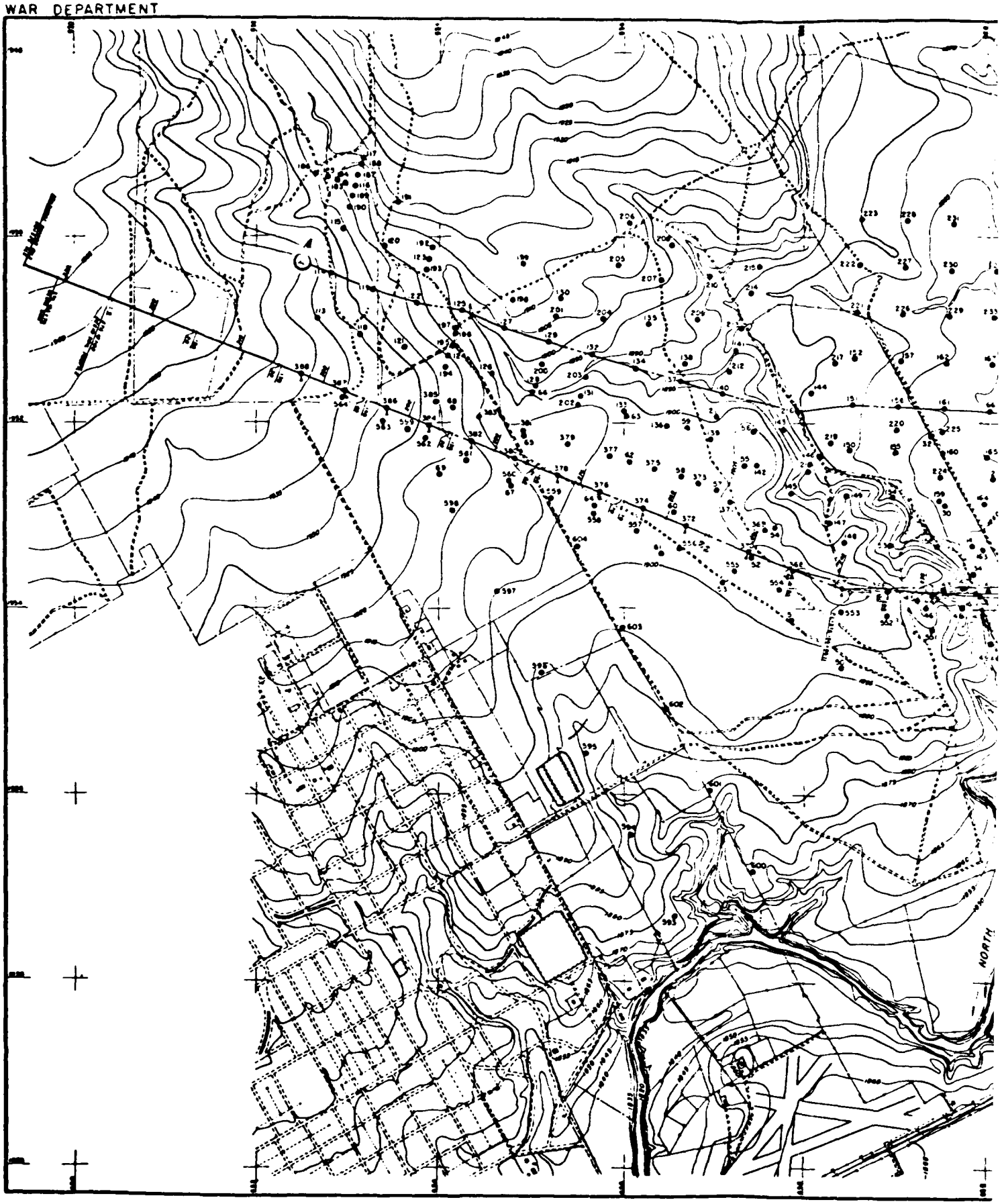
LEGEND

SAND SILT CLAY GRAVEL
SHALE LIMESTONE SANDSTONE CONGLOMERATE
3½" CORE BORING
6" CORE BORING
8" CORE BORING
CALICHE

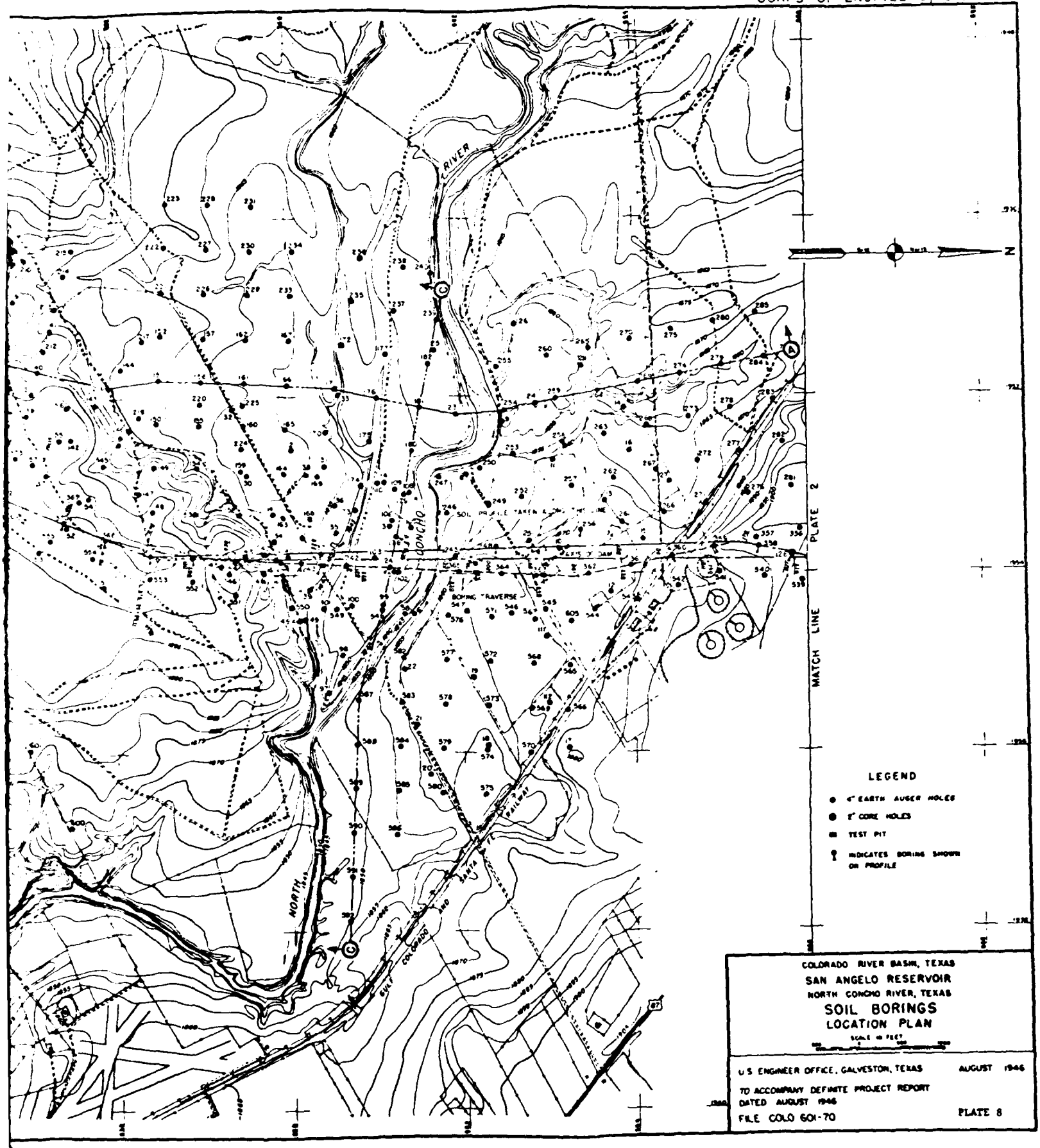
COLORADO RIVER BASIN, TEXAS
SAN ANGELO RESERVOIR
NORTH CONCHO RIVER, TEXAS
CORE BORINGS
PLAN AND GEOLOGIC SECTION
NO 18 SHEETS SHEET NO 8
SCALES AS SHOWN

U S ENGINEER OFFICE, GALVESTON, TEXAS AUGUST 1946
TO ACCOMPANY DEFINITE PROJECT REPORT
DATED AUGUST 1946
FILE COLO 601-70 PLATE 7

WAR DEPARTMENT

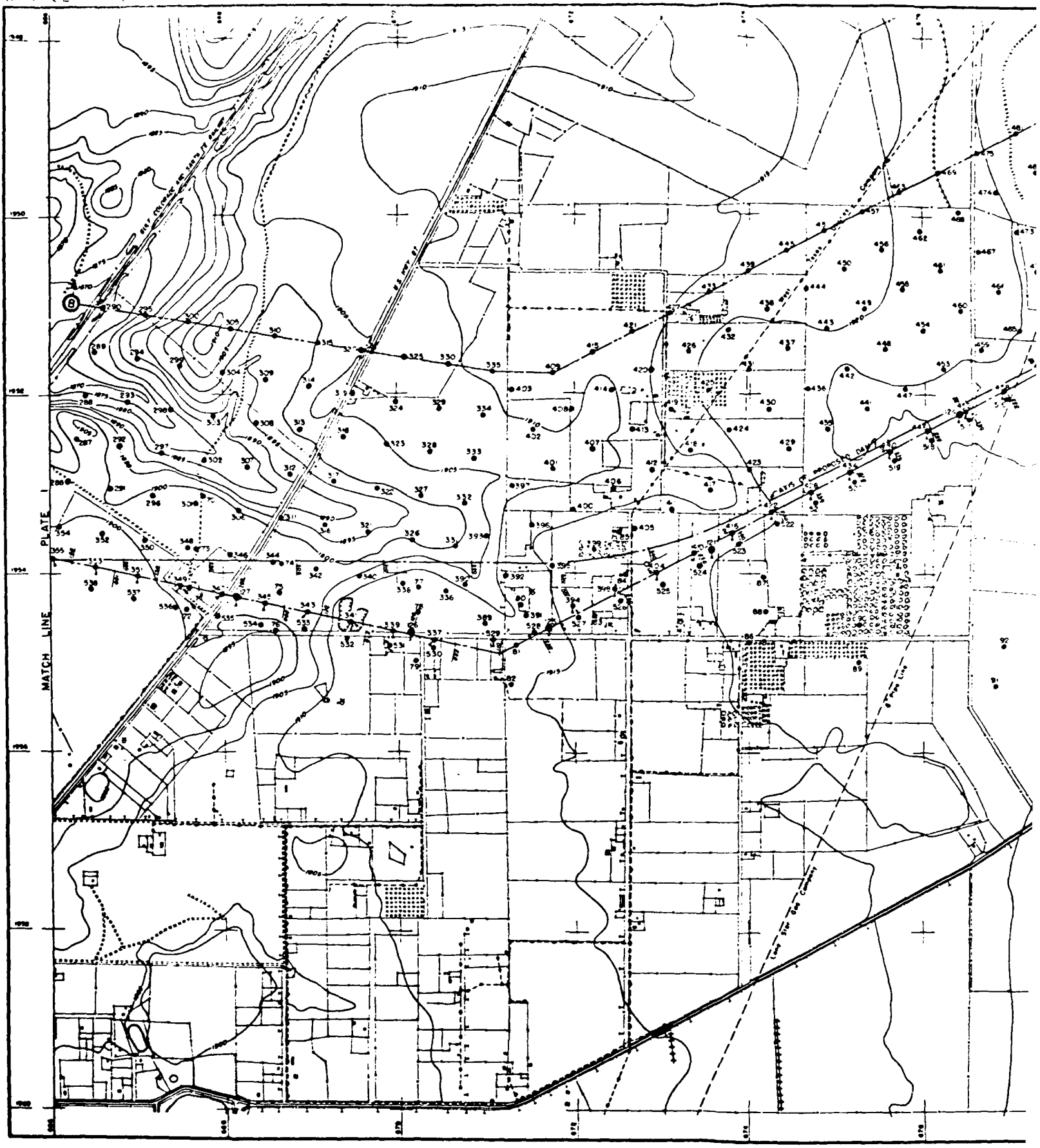


CORPS OF ENGINEERS, U.S. ARMY

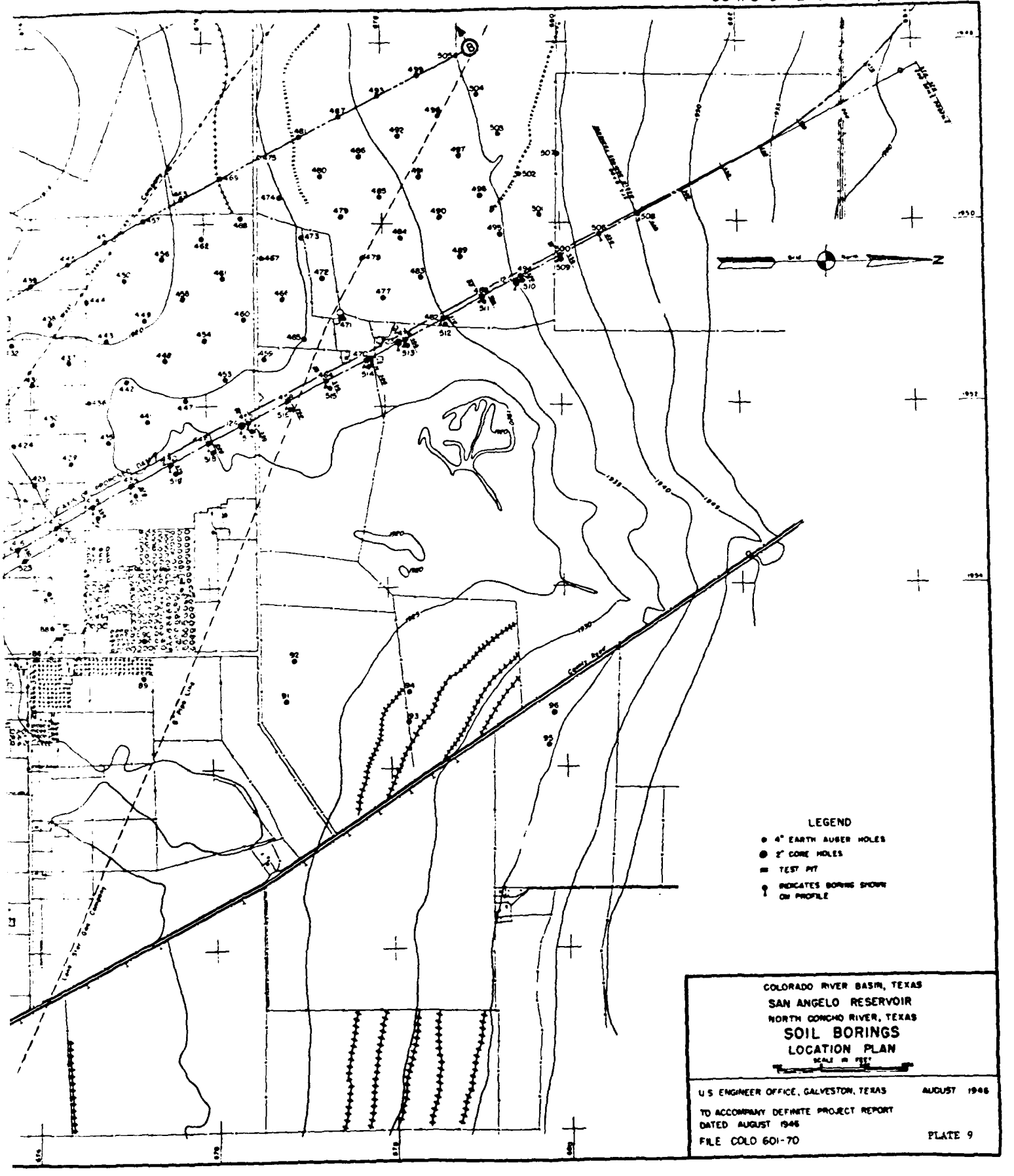


COLORADO RIVER BASIN, TEXAS
SAN ANGELO RESERVOIR
NORTH CONCHO RIVER, TEXAS
SOIL BORINGS
LOCATION PLAN
SCALE IN FEET

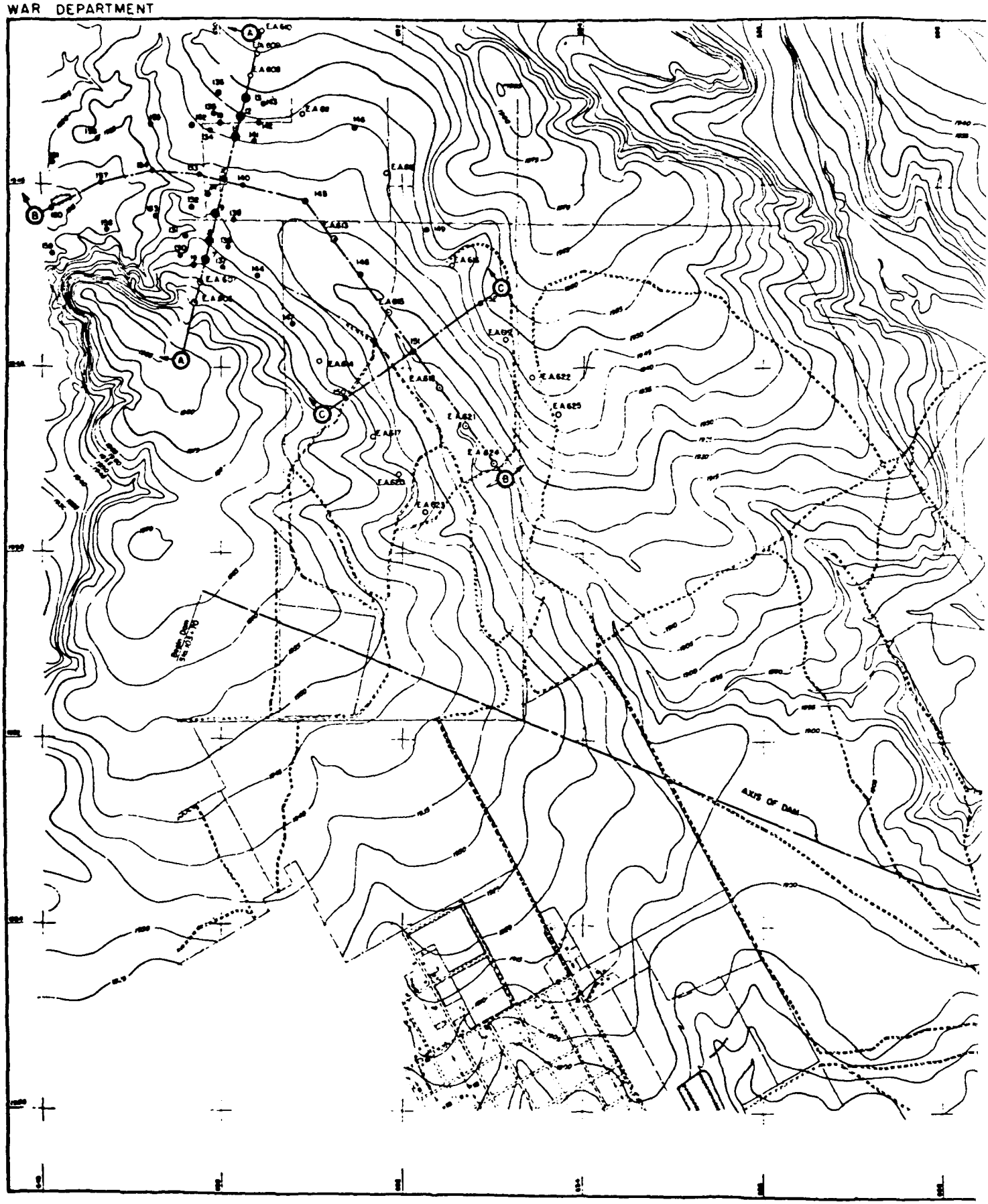
U.S. ENGINEER OFFICE, GALVESTON, TEXAS AUGUST 1946
TO ACCOMPANY DEFINITE PROJECT REPORT
DATED AUGUST 1946
FILE COLO 601-70 PLATE 8

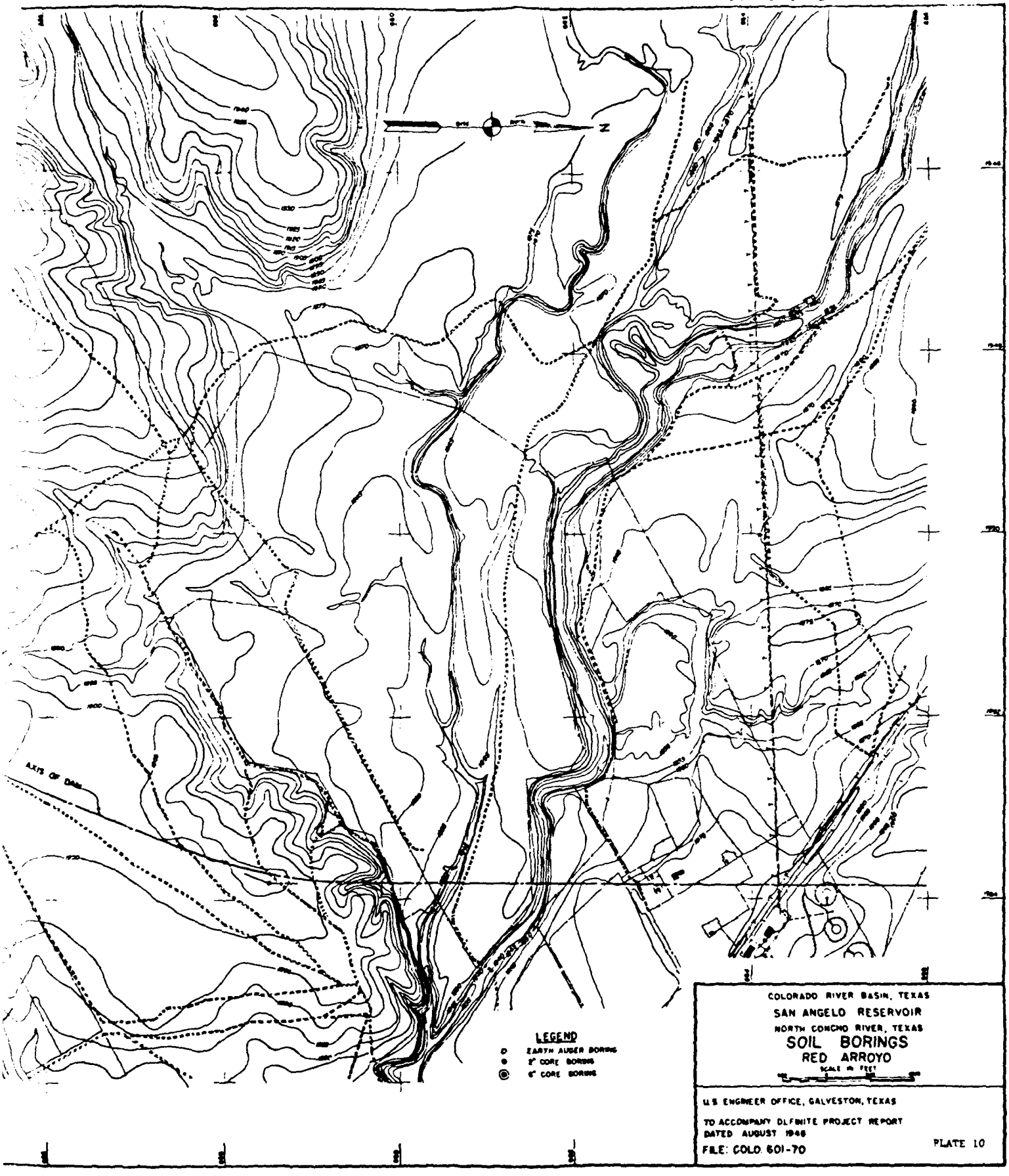

MATCH LINE
PLATE I

CORPS OF ENGINEERS, U. S. ARMY



WAR DEPARTMENT





COLORADO RIVER BASIN, TEXAS

SAN ANGELO RESERVOIR

NORTH CONCHO RIVER, TEXAS

SOIL BORINGS

RED ARROYO

SCALE IN FEET

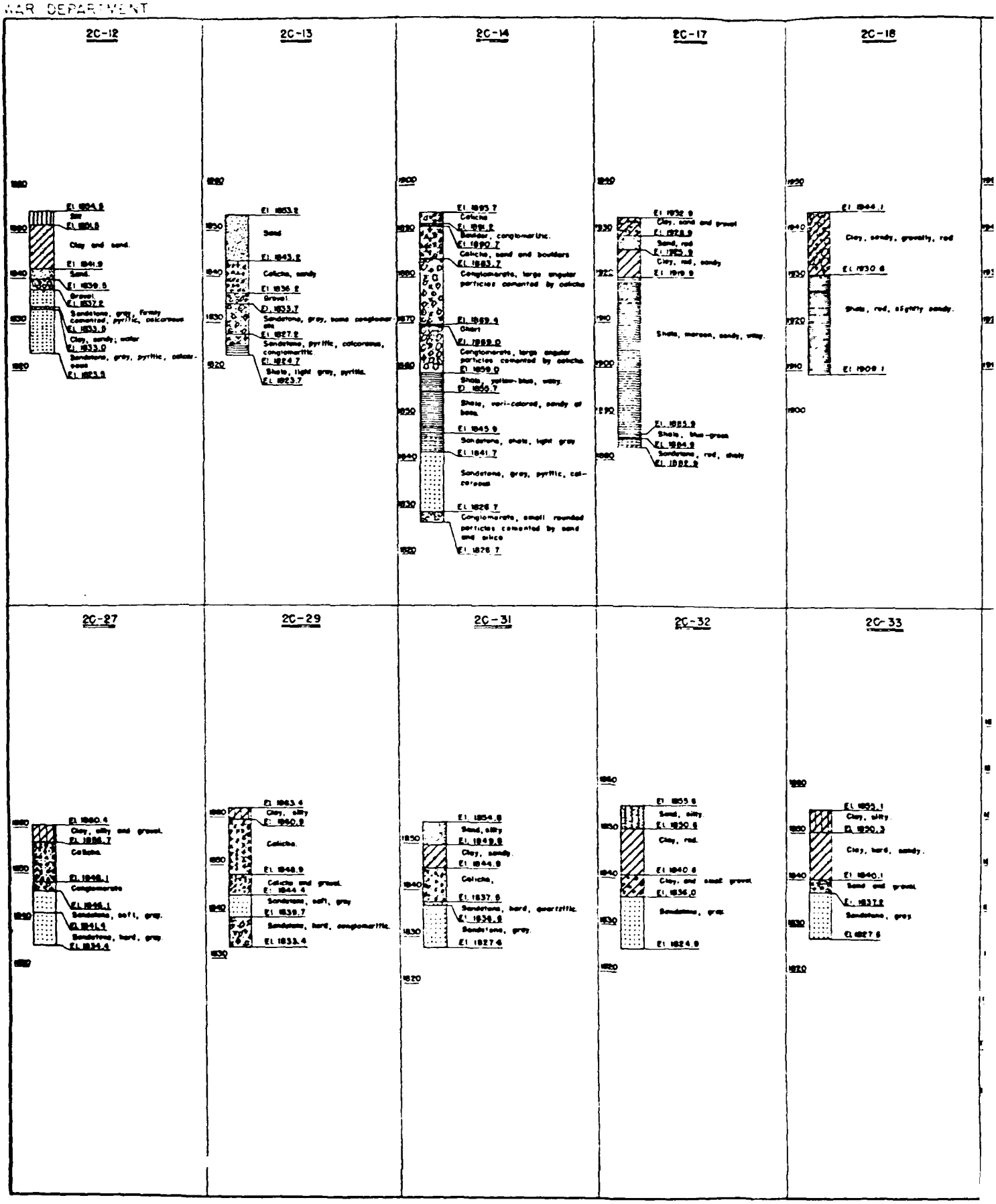
U.S. ENGINEER OFFICE, GALVESTON, TEXAS

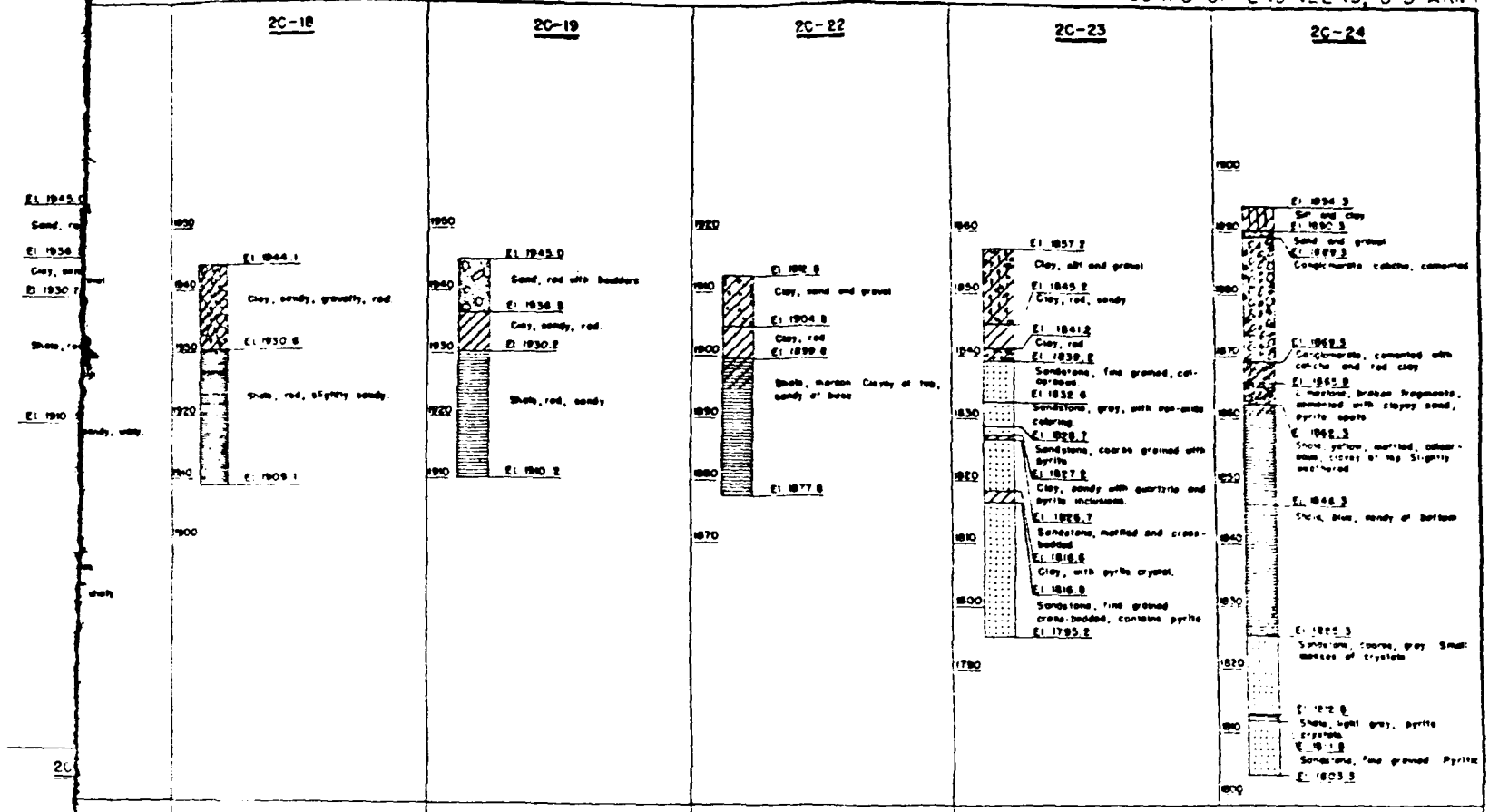
TO ACCOMPANY DEFINITE PROJECT REPORT
DATED AUGUST 1948

FILE: COLO 601-70

PLATE 10

WAR DEPARTMENT





NOTE
For location of core borings see appendix X, plate 2

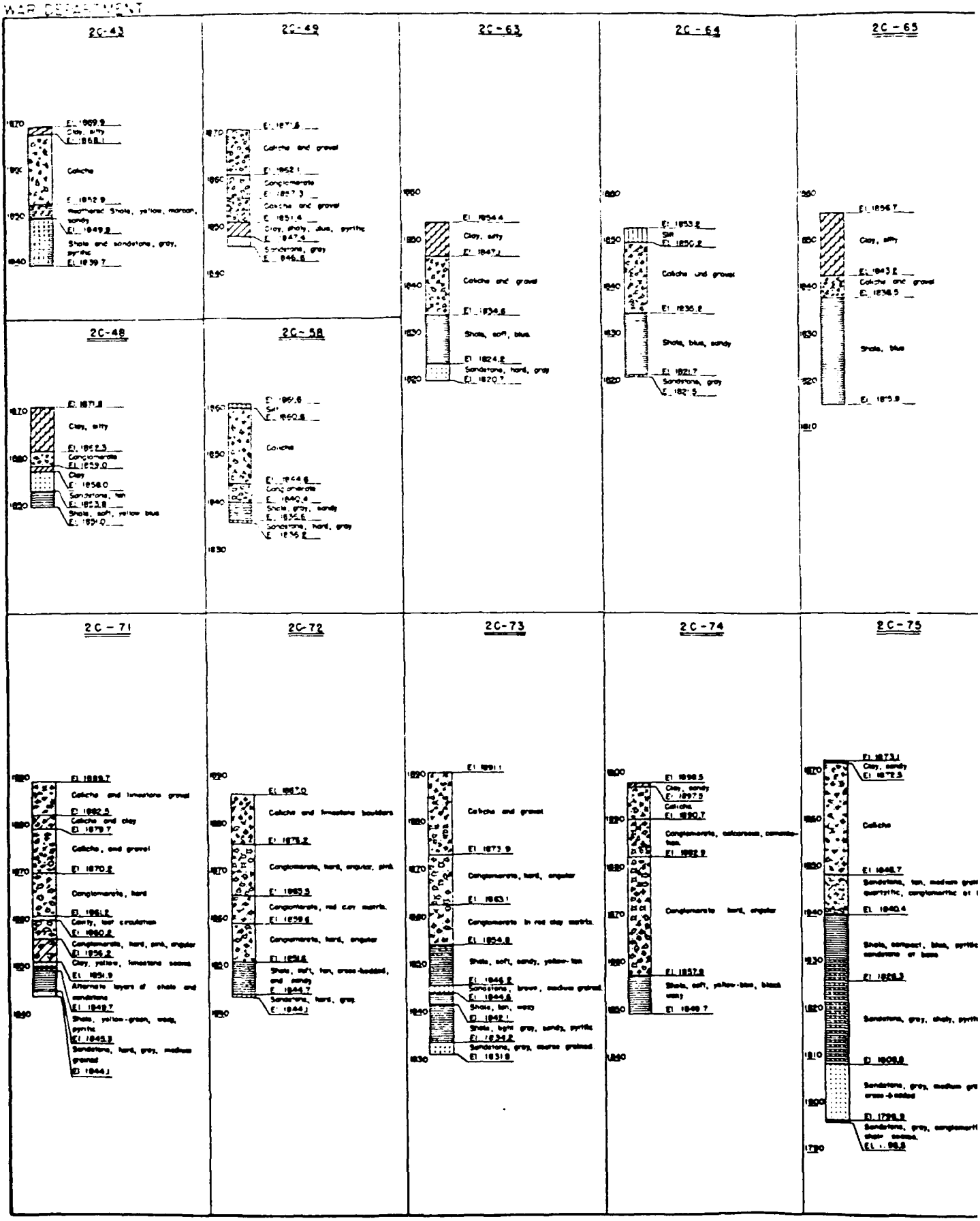
COLORADO RIVER BASIN, TEXAS
SAN ANGELO RESERVOIR
NORTH CONCHO RIVER, TEXAS
CORE BORINGS
GRAPHIC LOGS

U S ENGINEER OFFICE, GALVESTON, TEXAS AUGUST 194

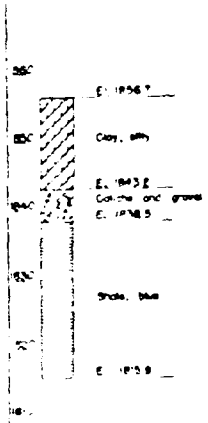
TO ACCOMPANY DEFINITE PROJECT REPORT
DATED AUGUST 1946

FILE COLO 601-70 PLATE 11

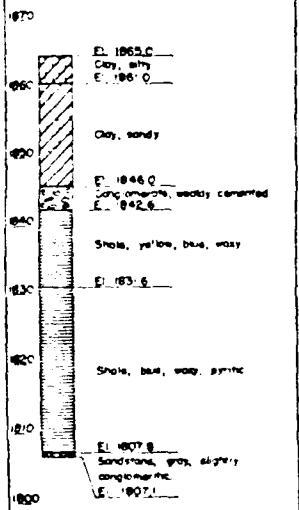
WAR DEPARTMENT



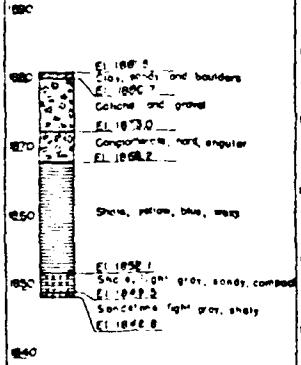
2C-65



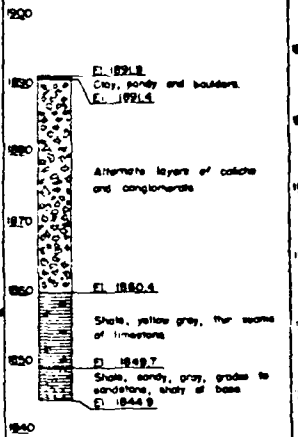
2C-66



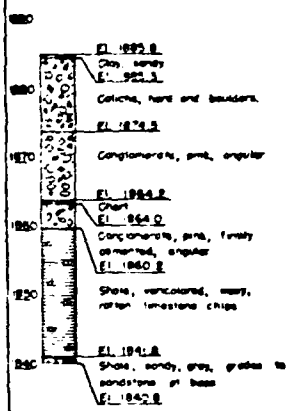
2C-68



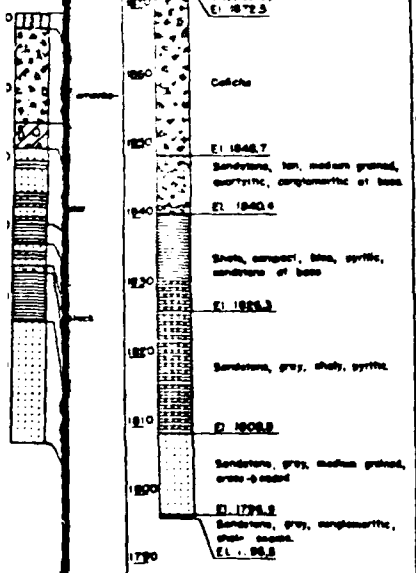
2C-69



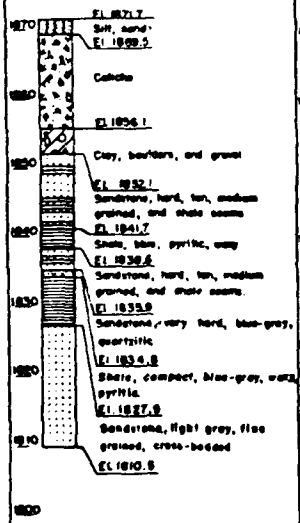
2C-70



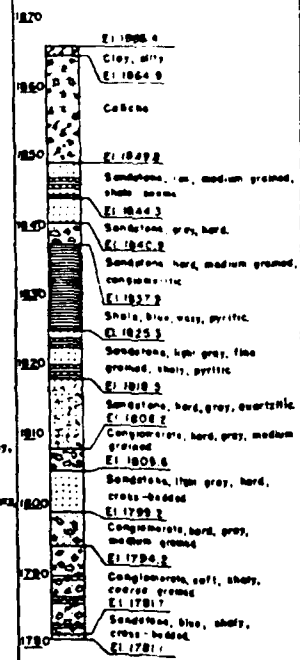
2C-75



2C-76



2C-77

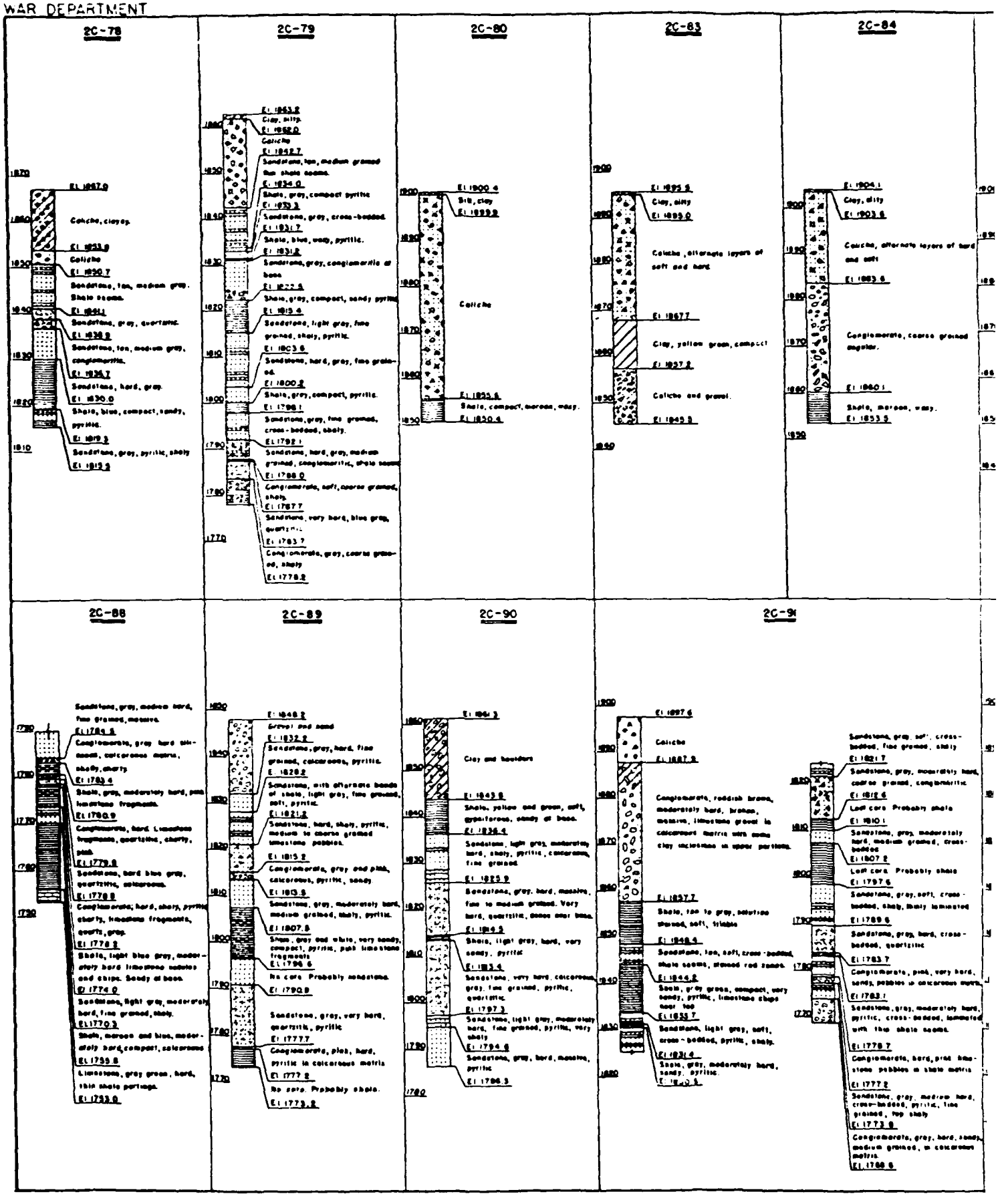


NOTE
For location of core borings see appendix II, plate 2

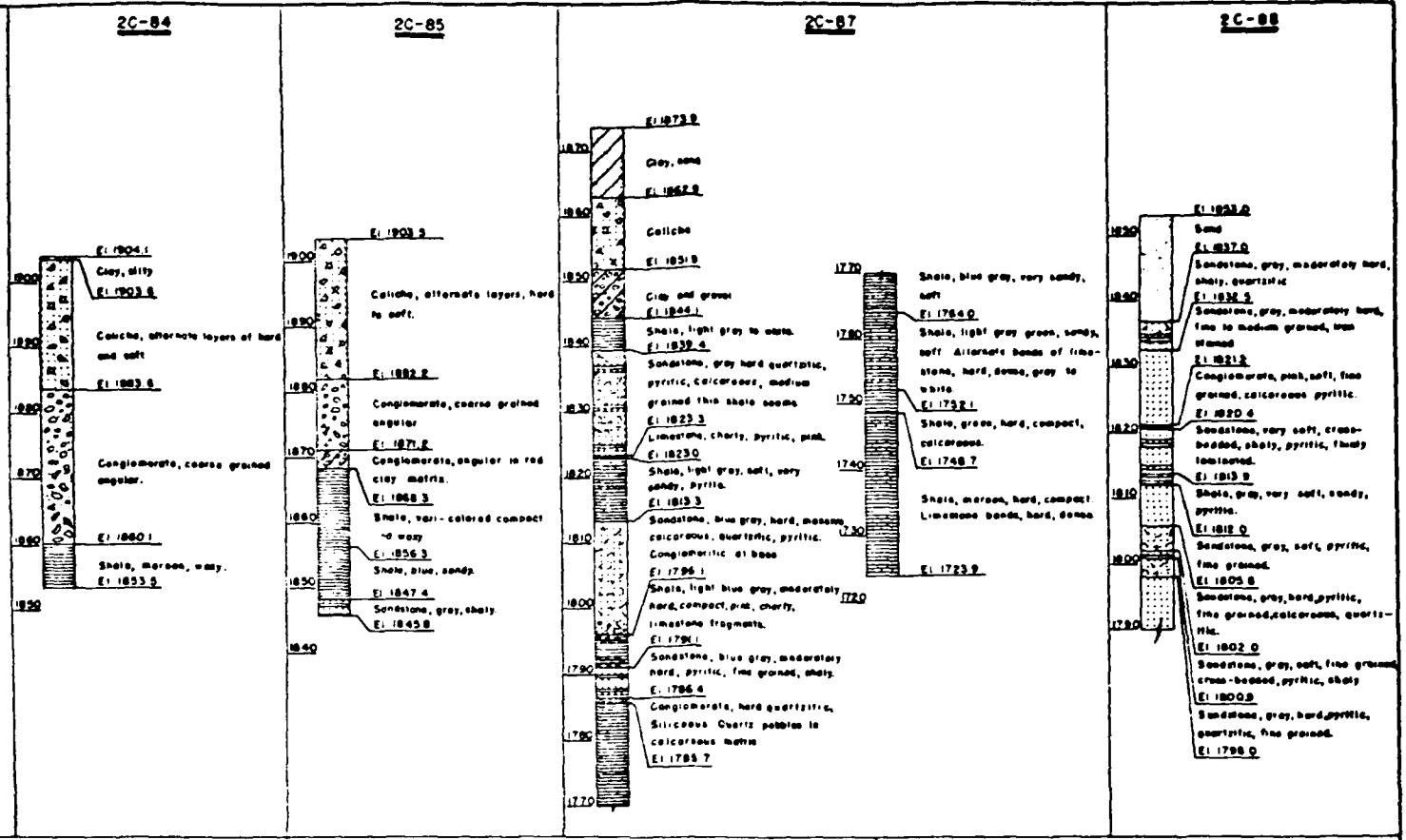
COLORADO RIVER BASIN, TEXAS
SAN ANGELO RESERVOIR
NORTH CONCHO RIVER, TEXAS
CORE BORINGS
GRAPHIC LOGS
IN 15 SHEETS — SHEET NO 12
SCALES AS SHOWN

U.S. ENGINEER OFFICE, GALVESTON, TEXAS — AUGUST 1946
TO ACCOMPANY DEFINITE PROJECT REPORT
DATED AUGUST 1946
FILE COLO 601-70 — PLATE 12

WAR DEPARTMENT



CORPS OF ENGINEERS U.S. ARMY

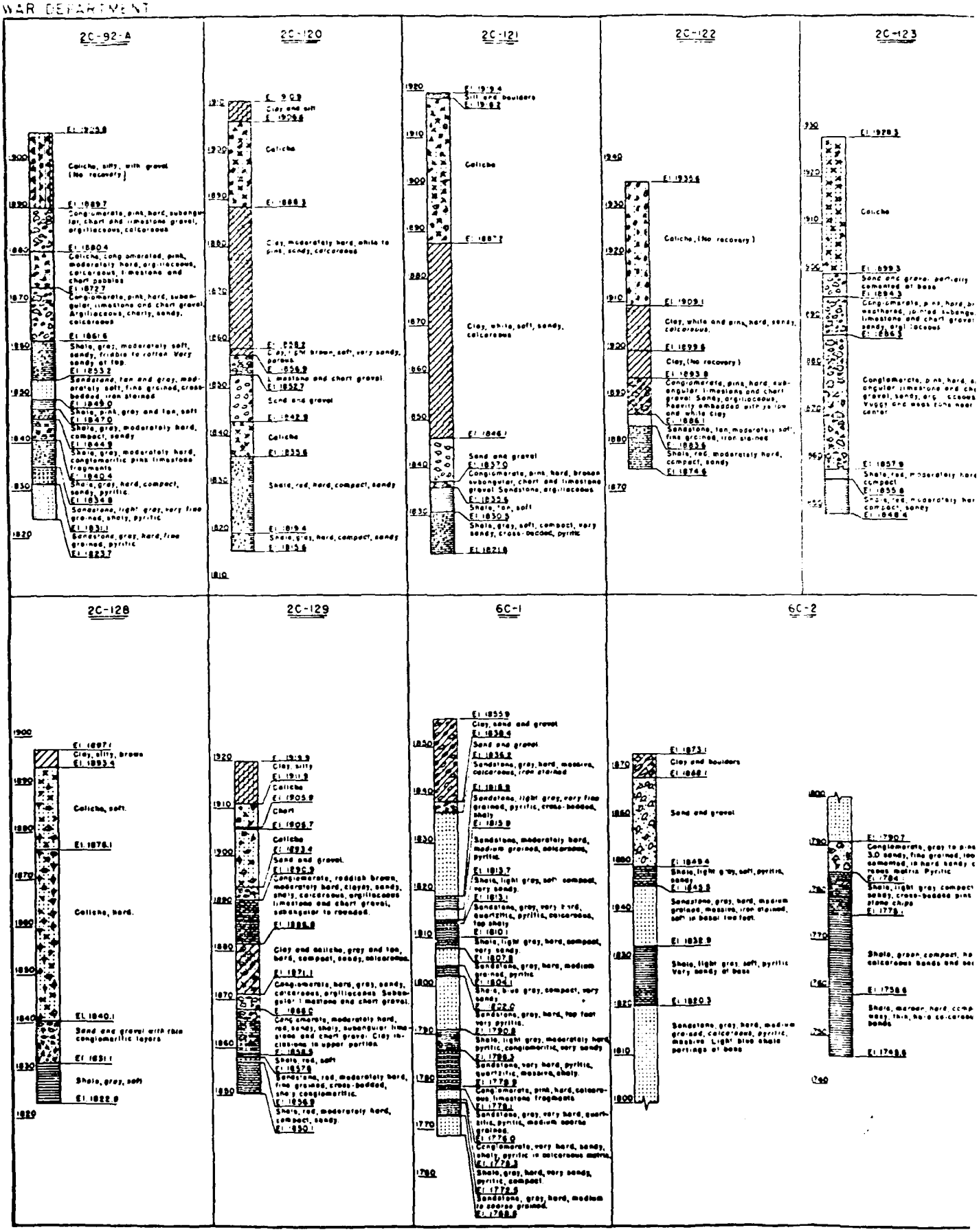


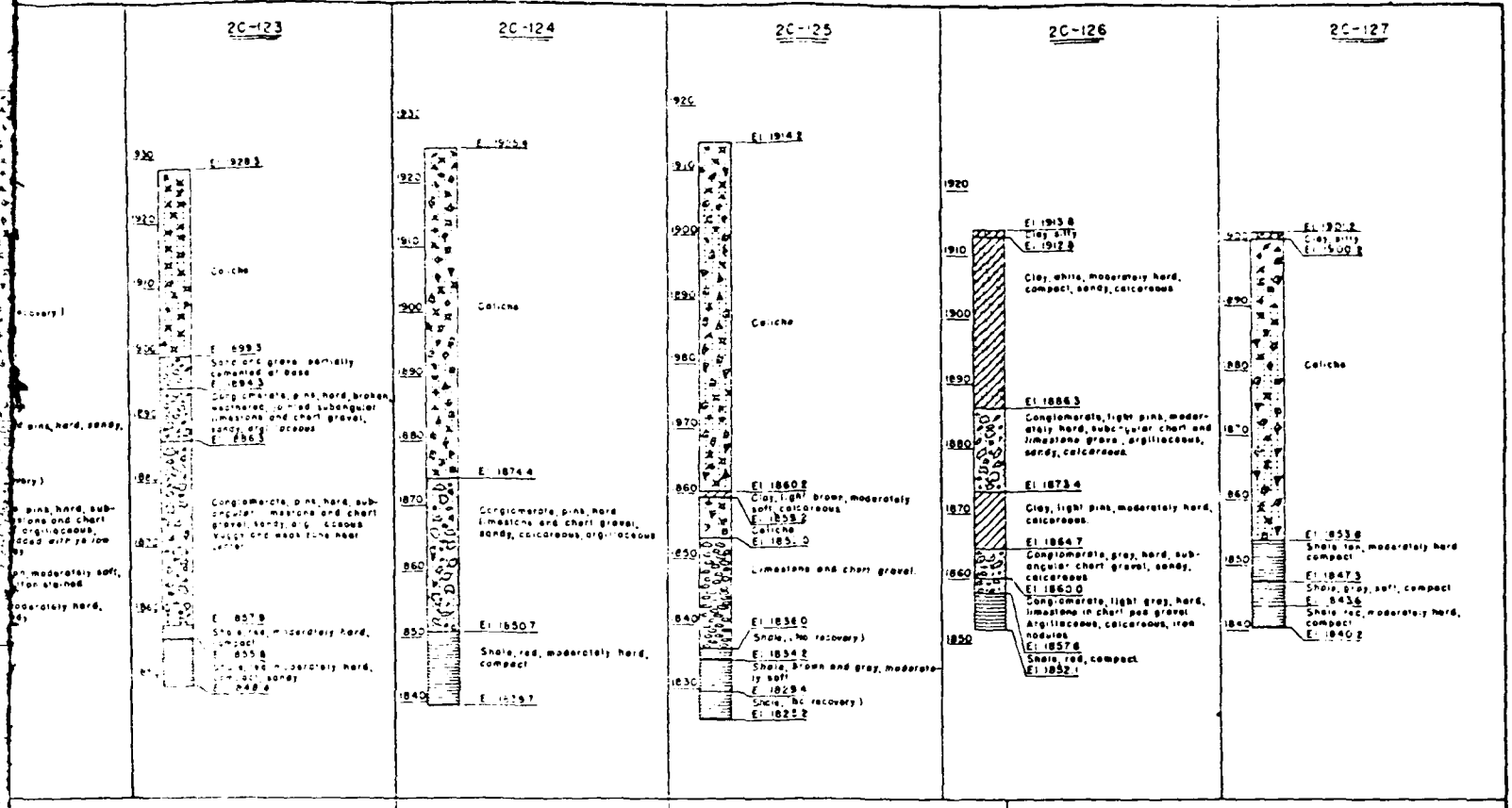
NOTE
For location of core borings see appendix X, plates 2 and 3

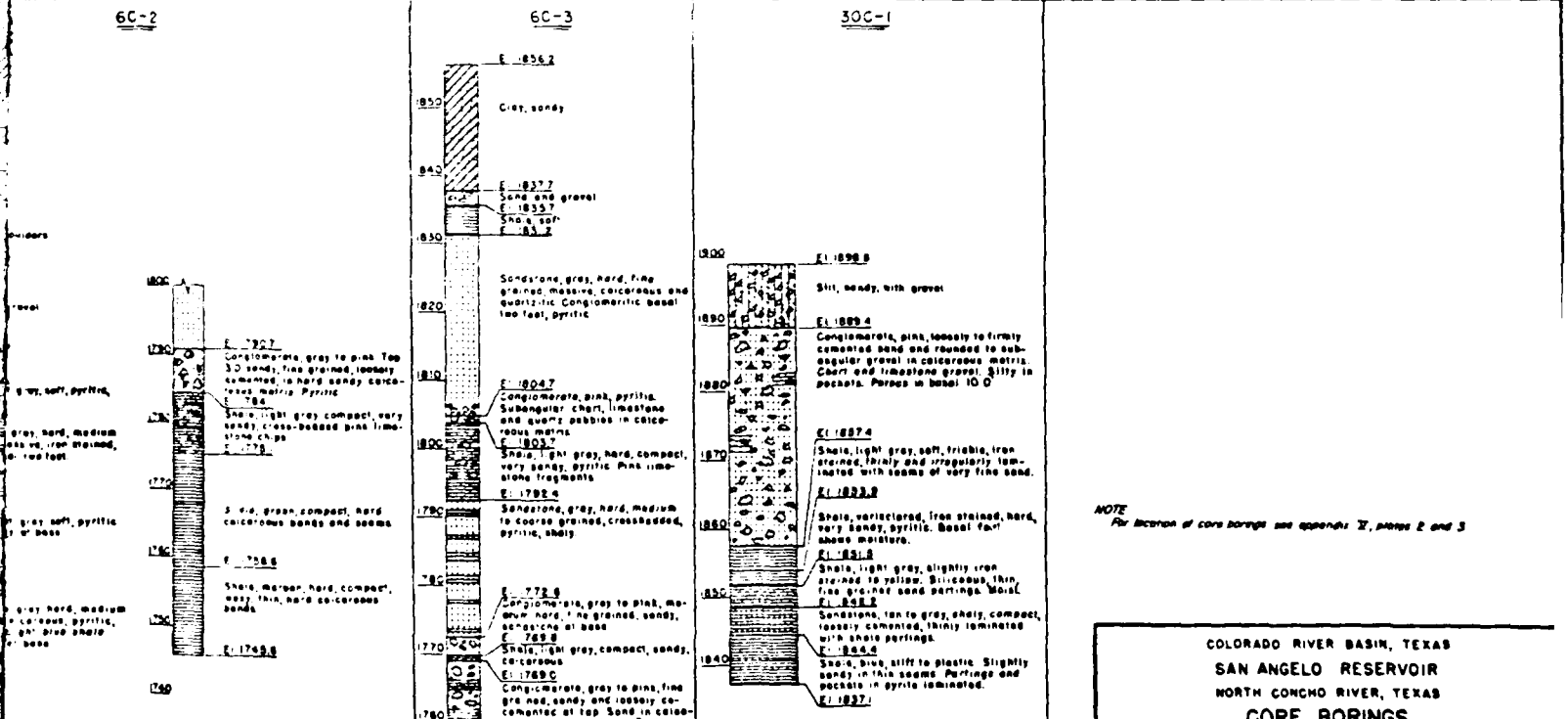
COLORADO RIVER BASIN, TEXAS
SAN ANGELO RESERVOIR
NORTH CONCHO RIVER, TEXAS
CORE BORINGS
GRAPHIC LOGS
SCALES AS SHOWN

U.S. ENGINEER OFFICE, GALVESTON, TEXAS AUGUST 1946
TO ACCOMPANY DEFINITE PROJECT REPORT DATED AUGUST 1946
FILE COLO 601-70
PLATE 13

WAR DEPARTMENT







NOTE
For location of core borings see appendix IV, plates 2 and 3

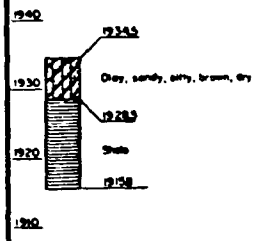
COLORADO RIVER BASIN, TEXAS
SAN ANGELO RESERVOIR
NORTH CONCHO RIVER, TEXAS

CORE BORINGS
GRAPHIC LOGS

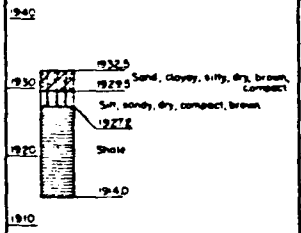
SHEETS — SHEET NO. 12
SCALES AS SHOWN

U S ENGINEER OFFICE, GALVESTON, TEXAS — AUGUST 1946
TO ACCOMPANY DEFINITE PROJECT REPORT
DATED AUGUST 1946
FILE COLO 601-70 — PLATE 14

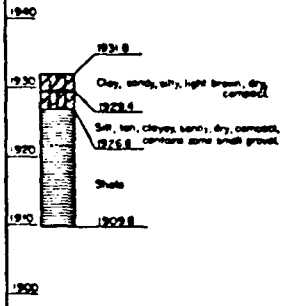
2C-133



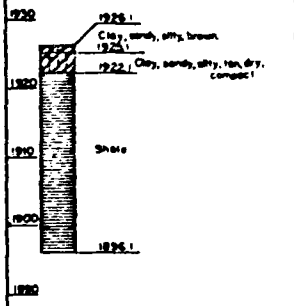
2C-140



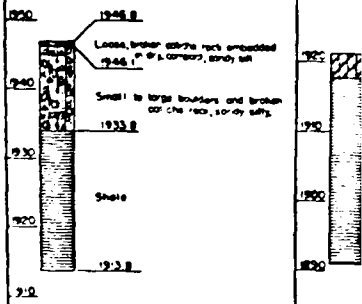
2C-145



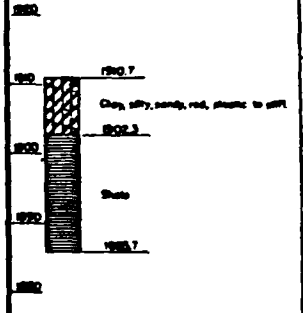
2C-148



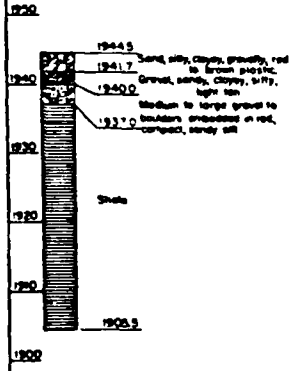
2C-150



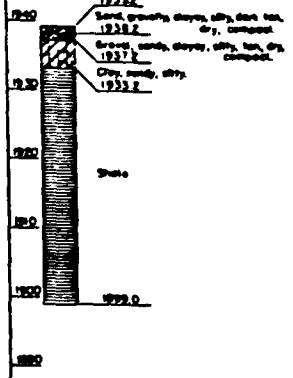
2C-160



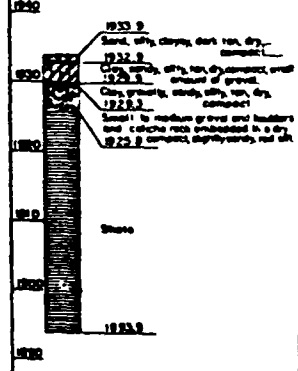
6C-7



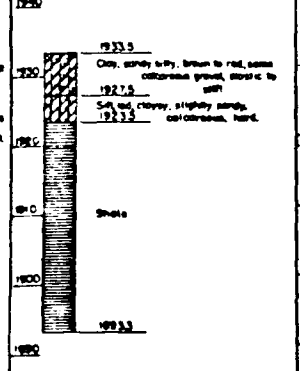
6C-8



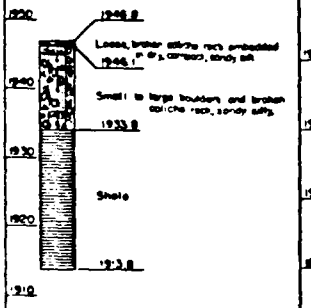
6C-9



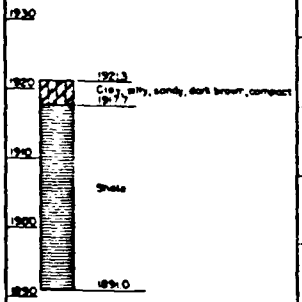
6C-10



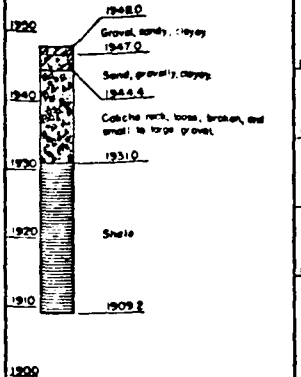
2C-150



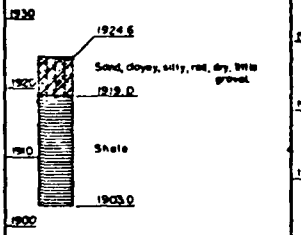
2C-151



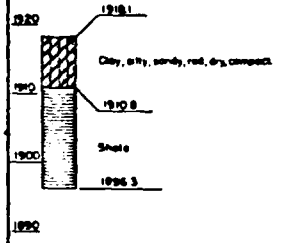
2C-152



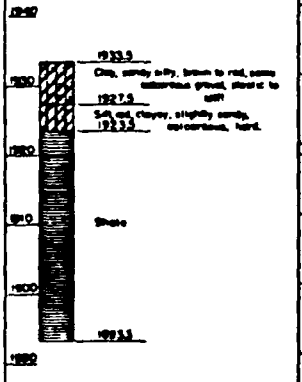
2C-154



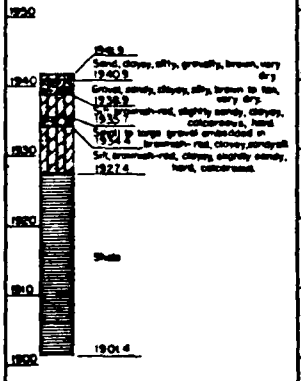
2C-157



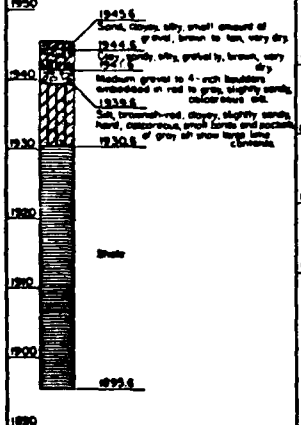
6C-10



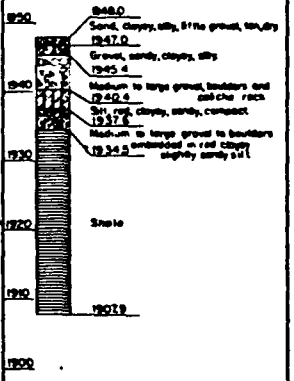
6C-11



6C-12



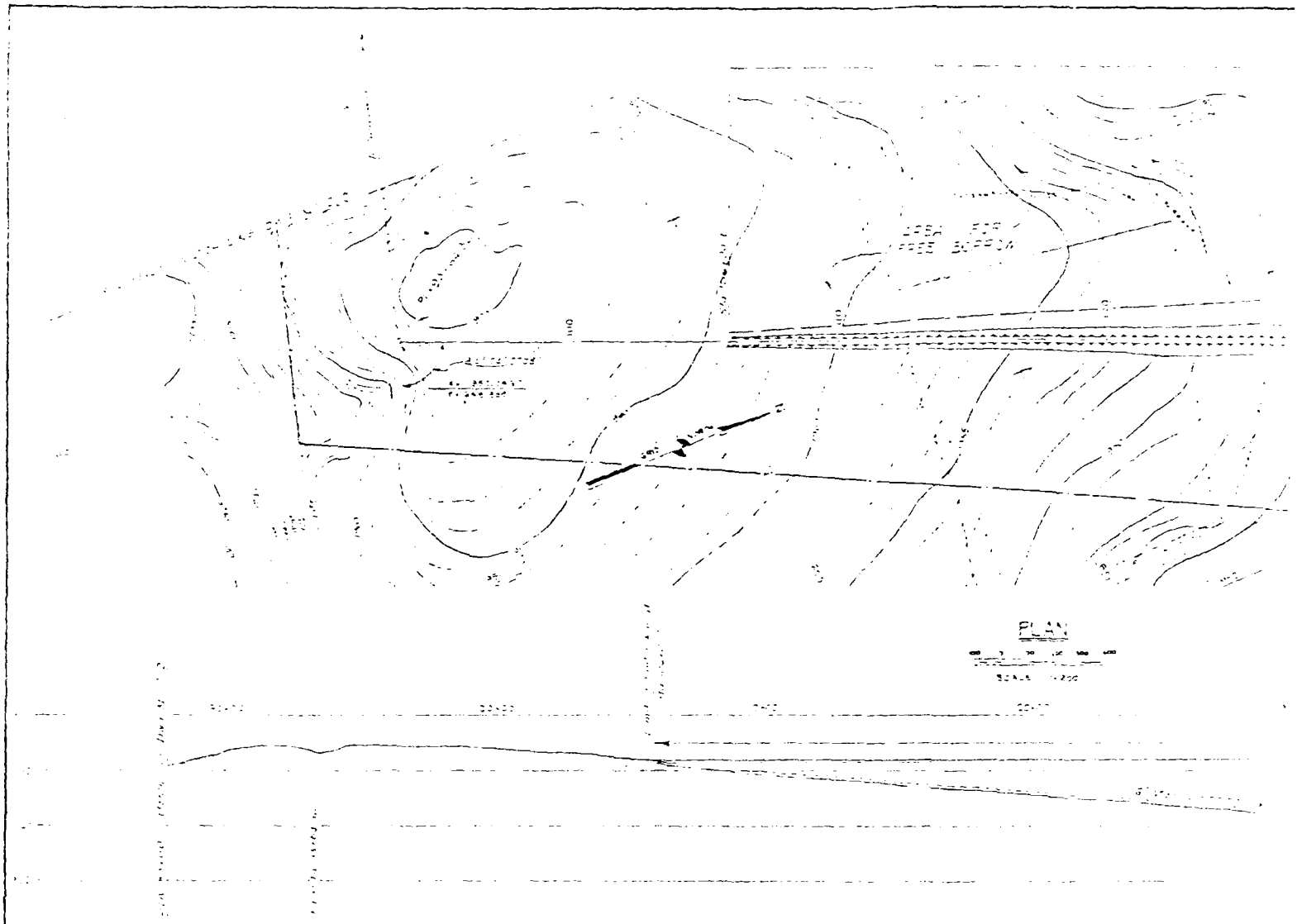
6C-13



NOTE
For location of core borings see appendix II, plate 2

COLORADO RIVER BASIN, TEXAS
SAN ANGELO RESERVOIR
NORTH CONCHO RIVER, TEXAS
CORE BORINGS
GRAPHIC LOGS
IN 15 SHEETS
SCALES AS SHOWN
SHEET NO. 15

U S ENGINEER OFFICE, GALVESTON, TEXAS AUGUST 1946
TO ACCOMPANY DEFINITE PROJECT REPORT
DATED AUGUST 1946
FILE. COLO 601-70
PLATE 15



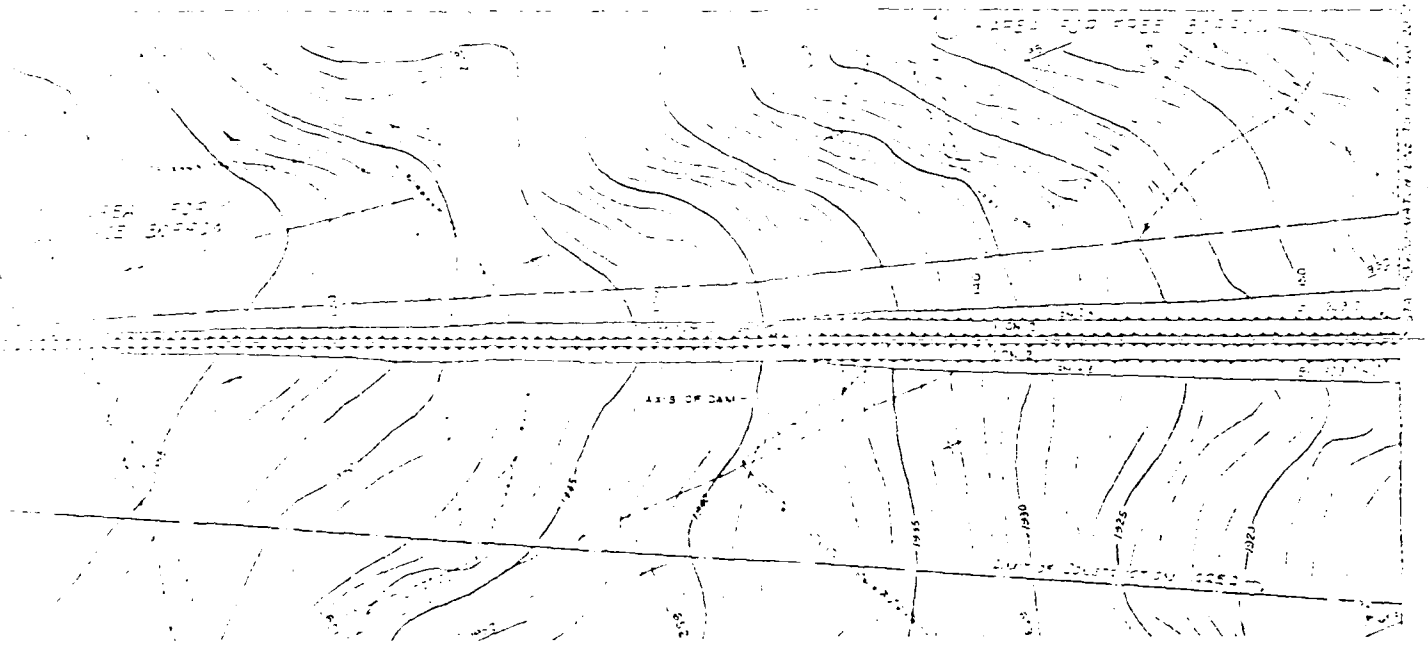
PLAN

SCALE 1:200

PROFILE ALONG AXIS

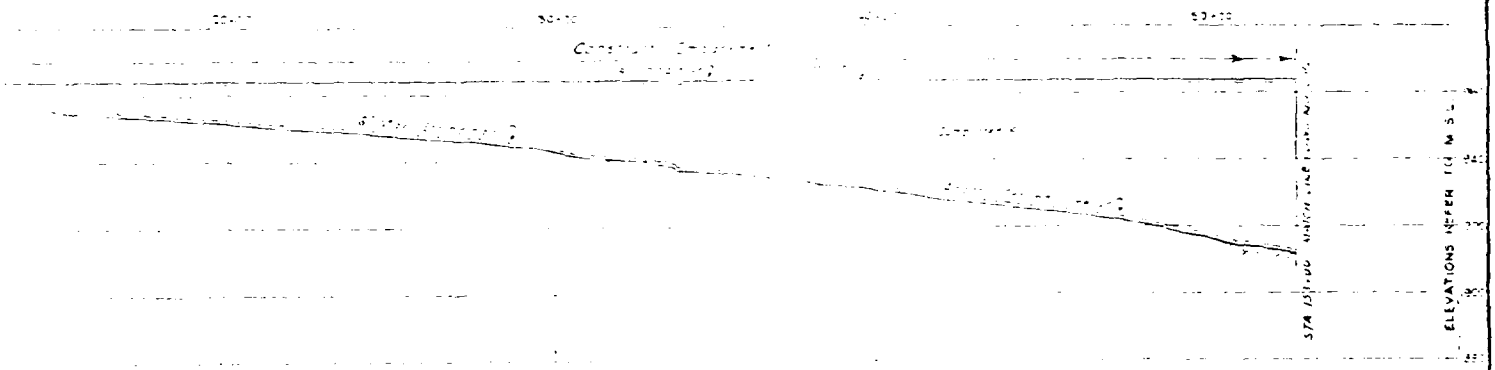
HORIZONTAL SCALE 1:200

VERTICAL SCALE 1:20



PLAN

SCALE 1"=200'



PROFILE ALONG AXIS

HORIZONTAL SCALE 1"=200'

VERTICAL SCALE 1"=20'

NOTES FOR DETAILS AND SECTIONS OF EMBANKMENT, SEE DWG. NO. 30 6

FIGURES IN CIRCLES THUS (3) INDICATE ITEM NUMBER UNDER WHICH PAYMENTS WILL BE MADE

FOR SOILS INFORMATION, SEE DWG NO 100 [illegible] 100 3

MATERIAL FROM RED BEDS EXCAVATION MAY BE USED IN EMBANKMENT FROM STA 129+00 TO STA 137+00

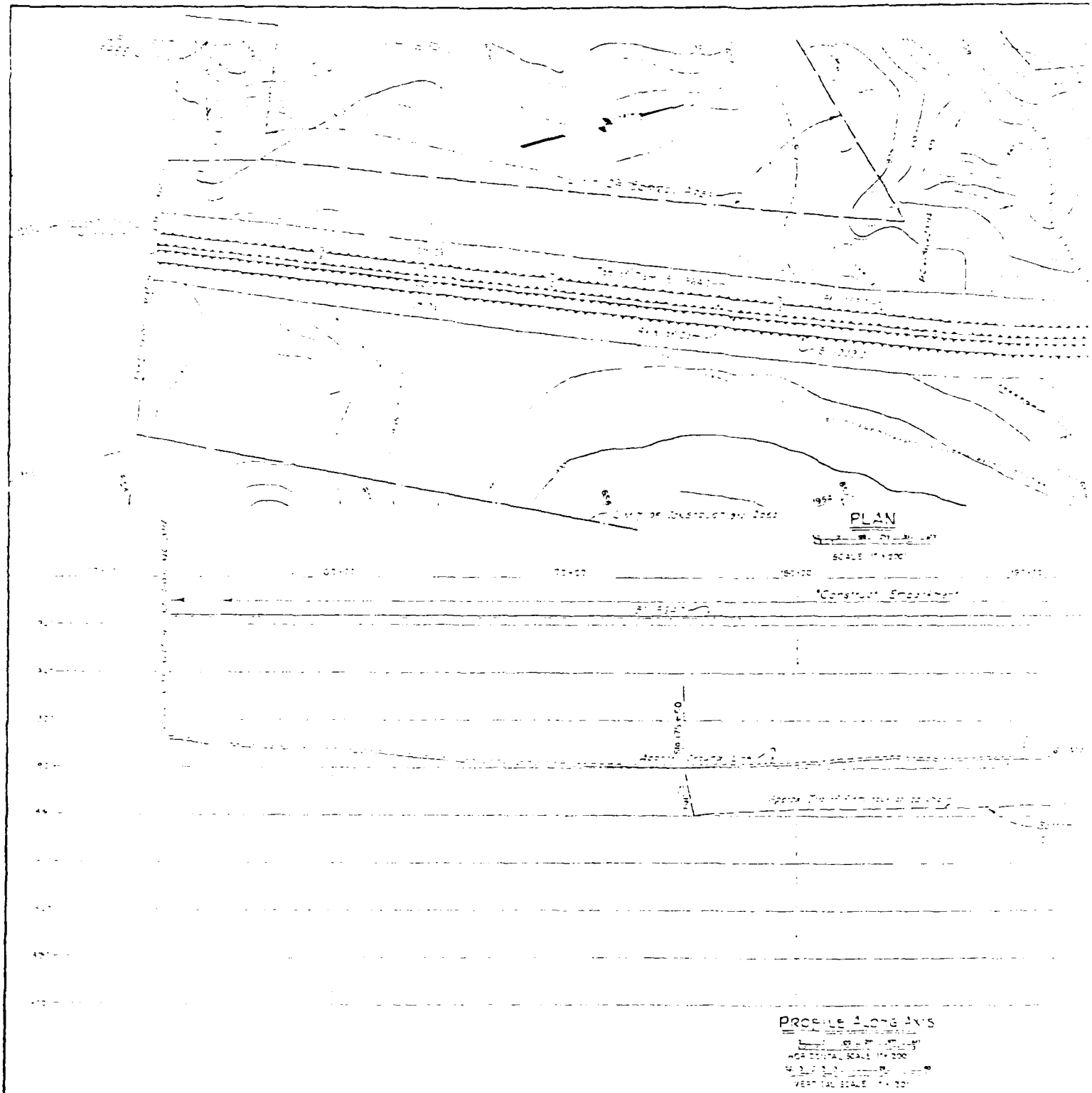
SAN ANGELO DAM AND RESERVOIR

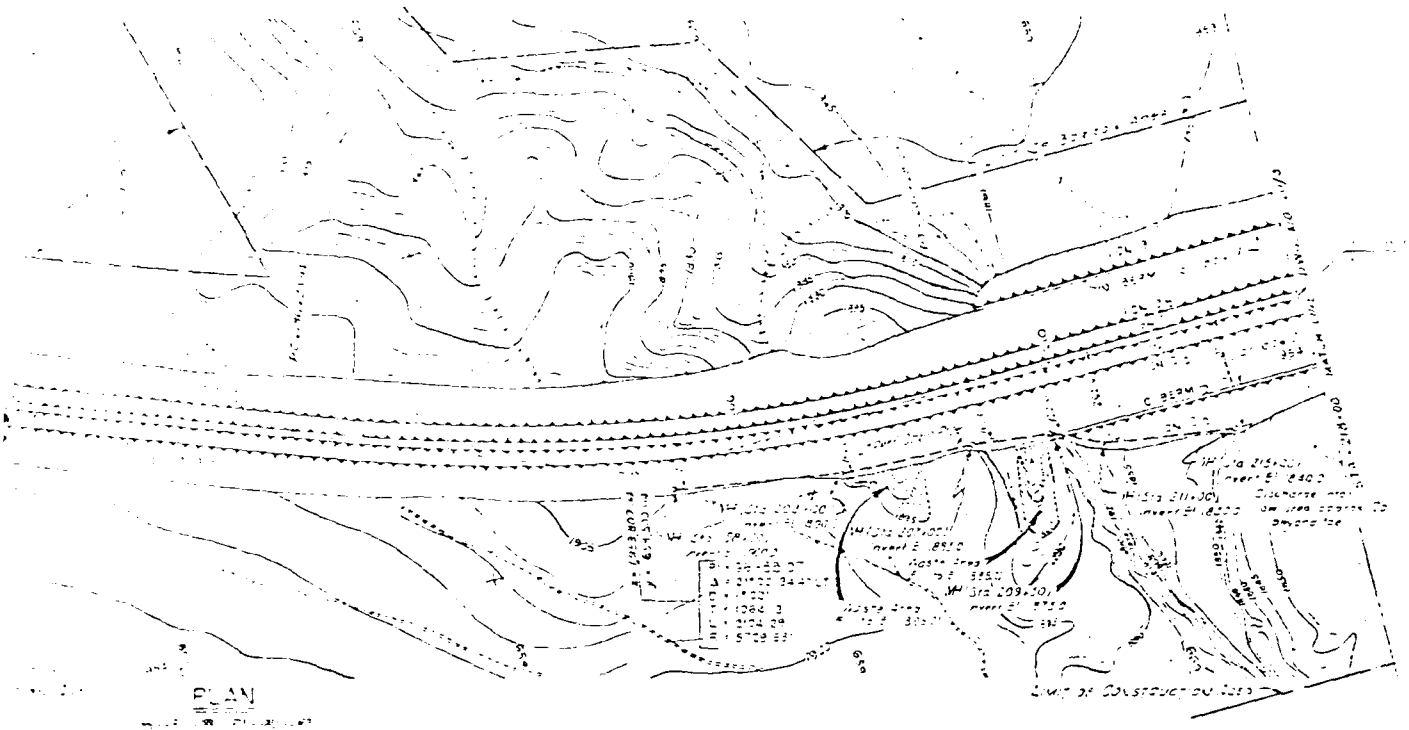
EMBANKMENT

PLAN AND PROFILE

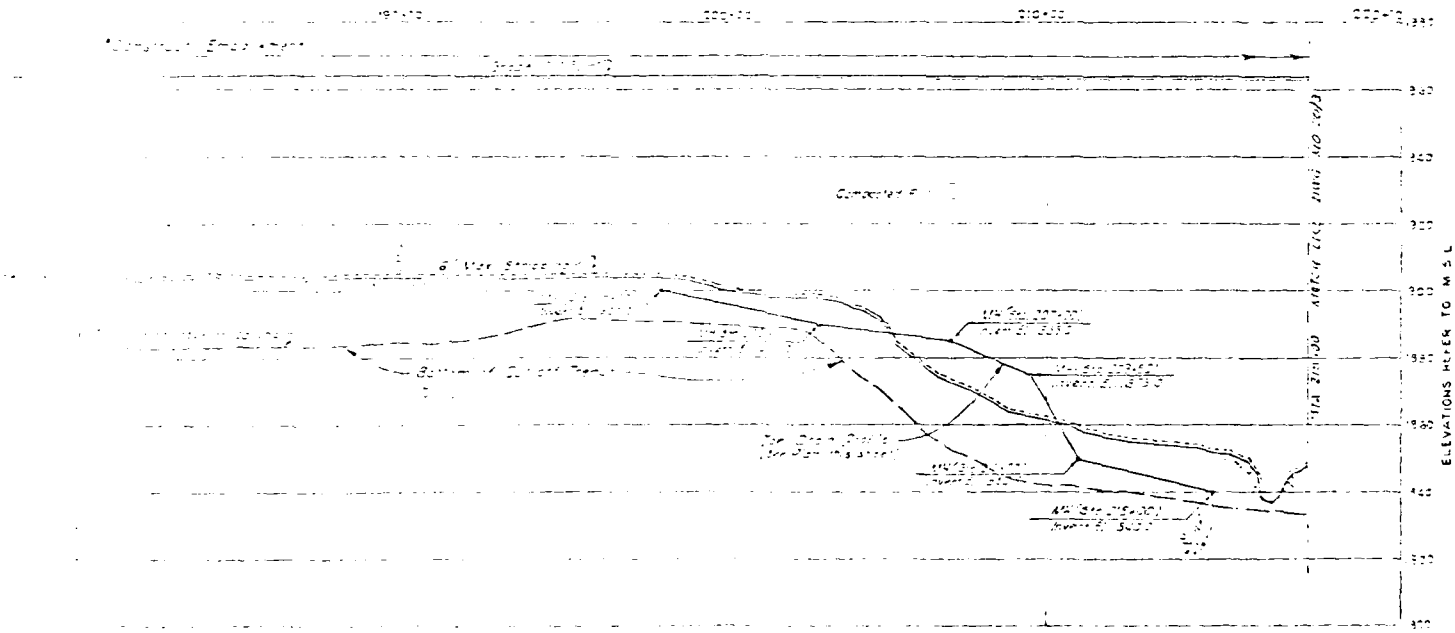
PLATE 16

AS BUILT


PLAN
SCALE 1" = 200'
PROFILE ALONG AXIS
HOR. CENTRAL SCALE 1" = 200'
VERTICAL SCALE 1" = 20'



PLAN



ELEVATIONS REFER TO M.S.L.

Profile Along Axis

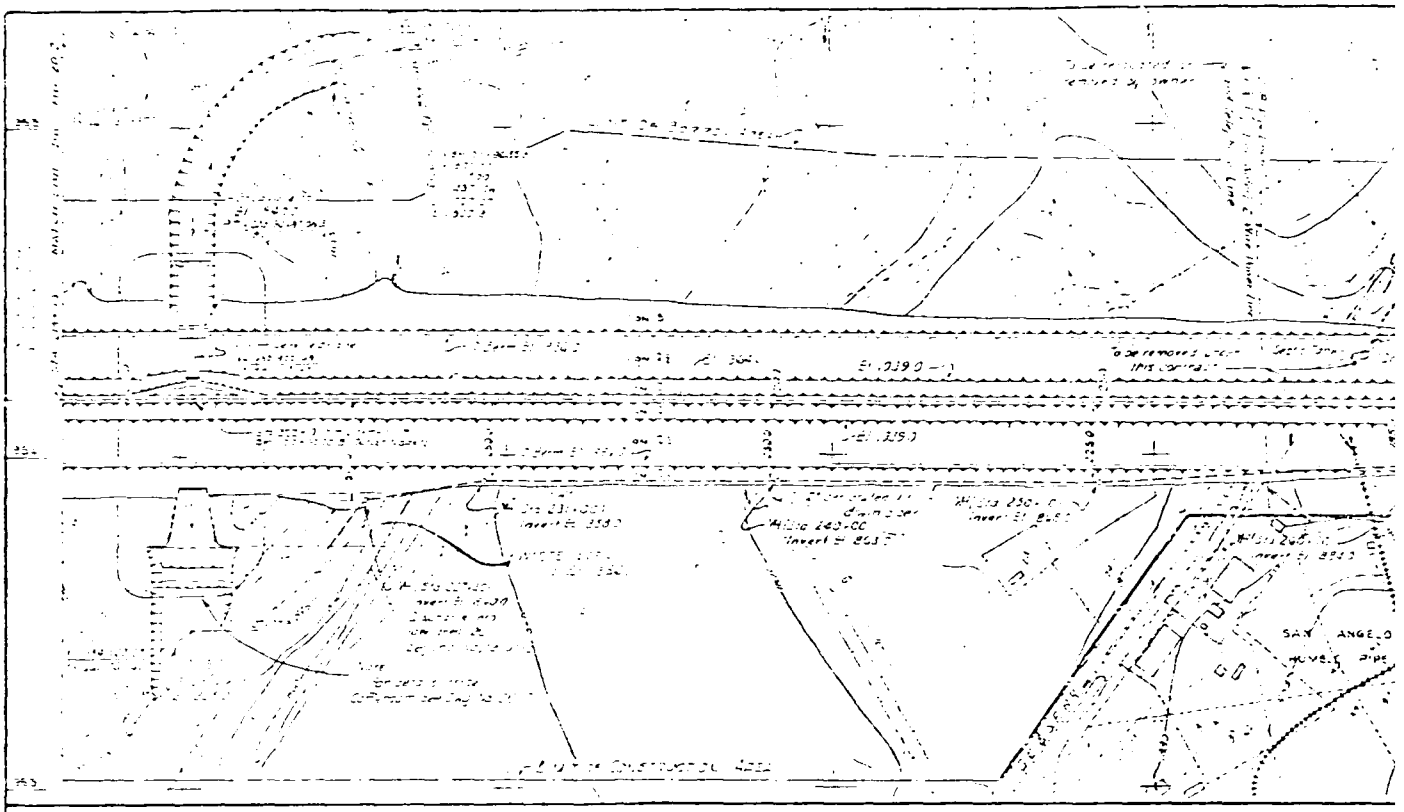
NOTES

COLORADO RIVER BASIN, TEXAS
SAN ANGELO DAM AND RESERVOIR
NORTH CONCHO RIVER, TEXAS

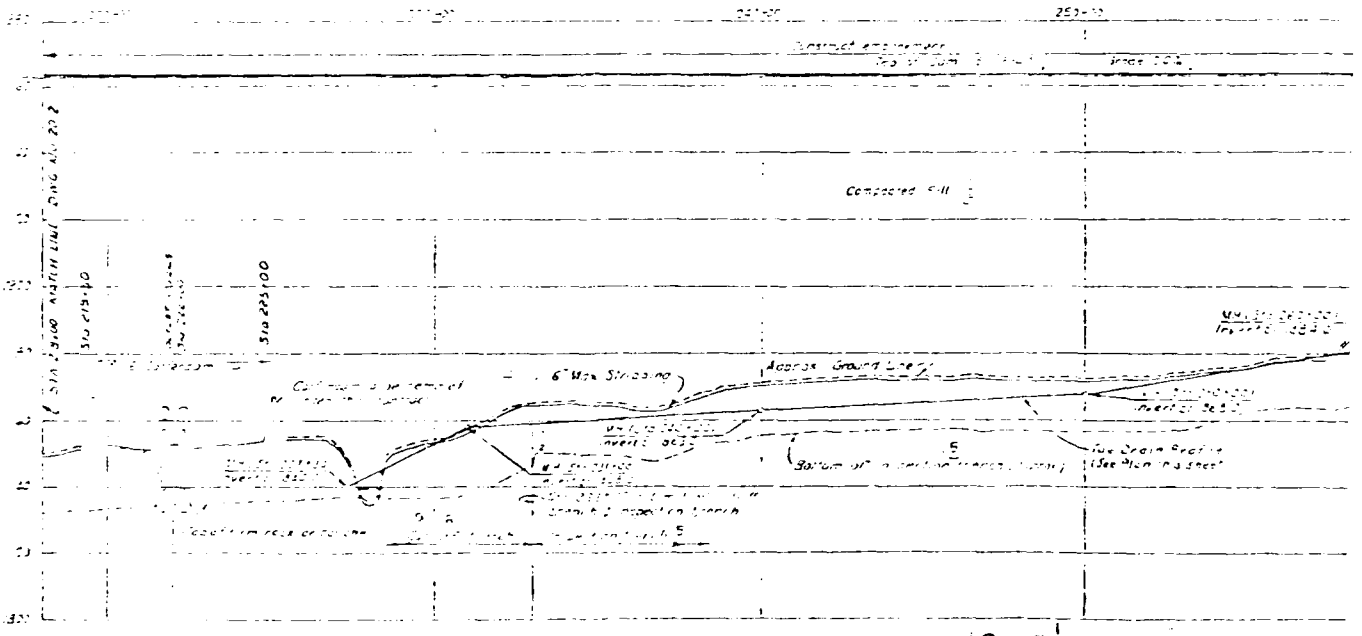
EMBANKMENT
PLAN AND PROFILE

PLATE 17

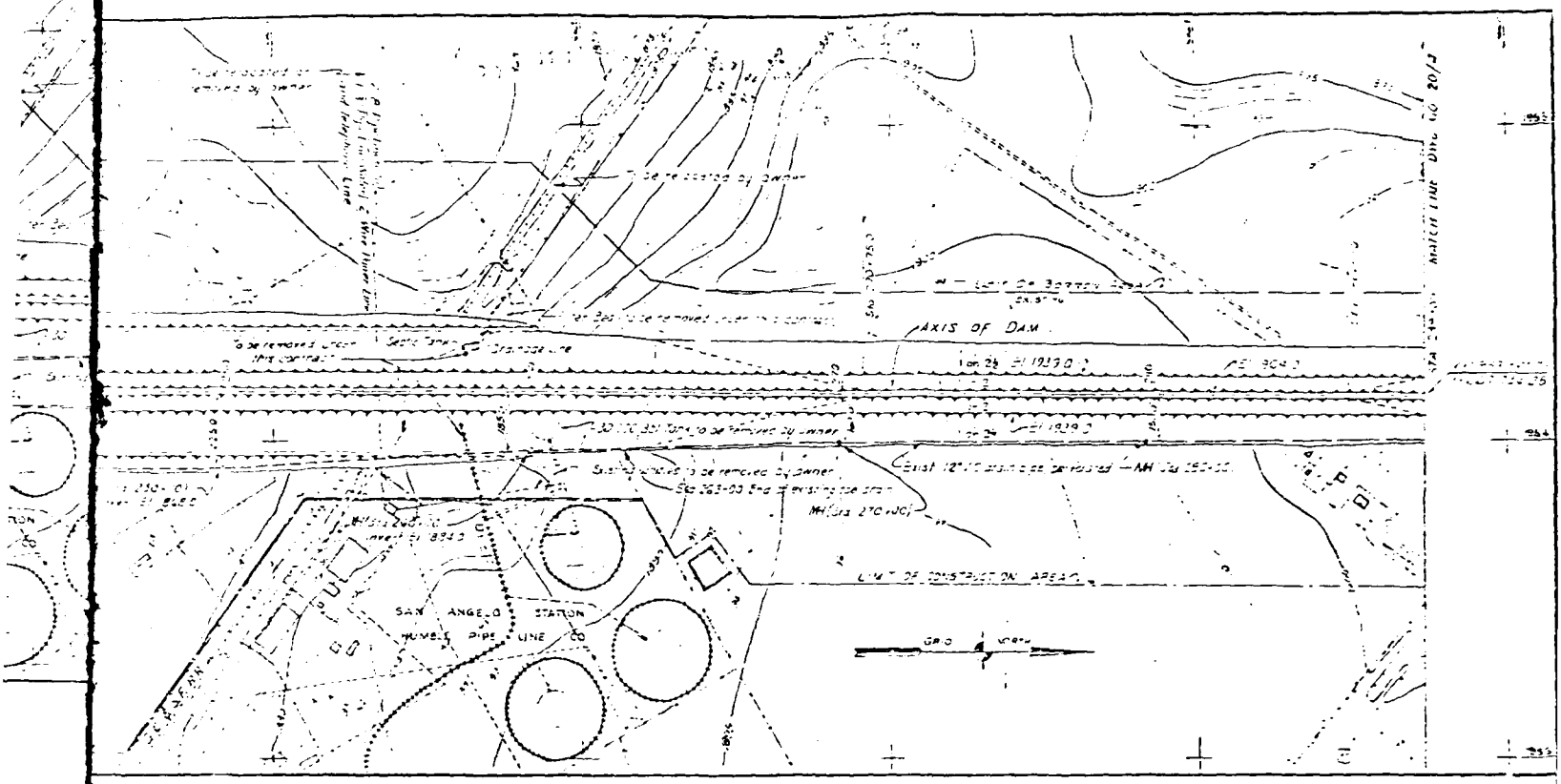
As Built



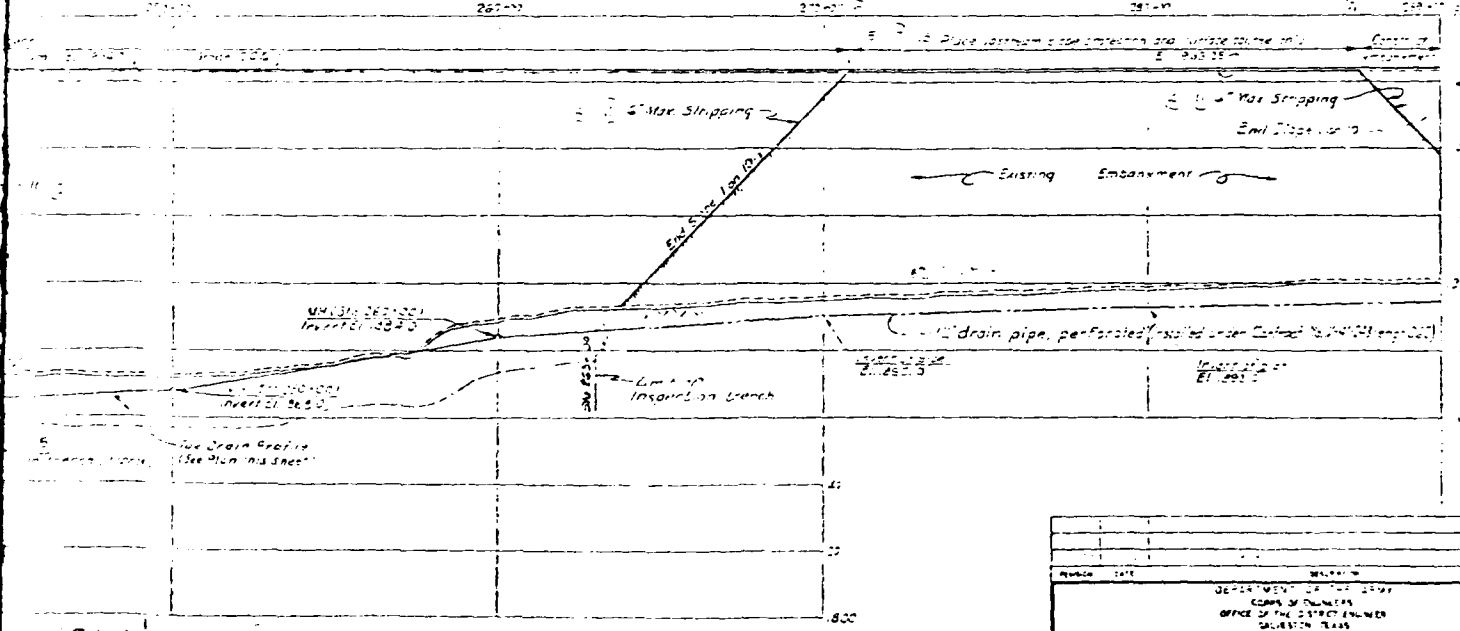
PLAN



PROFILE ALONG AXIS



PLAN



PROFILE ALONG AXIS

Notes

Figures in circles thus ① , indicate item number under which payment will be made.

For embankment sections and data see Dwg No 20/2

For soils information see Dwg Nos

For details of service spillway see Dwg No 20/1

For details of low drain & miscellaneous see Dwg No 20/3

For details of impervious core see Section VIII-A

Dwg No 20/6

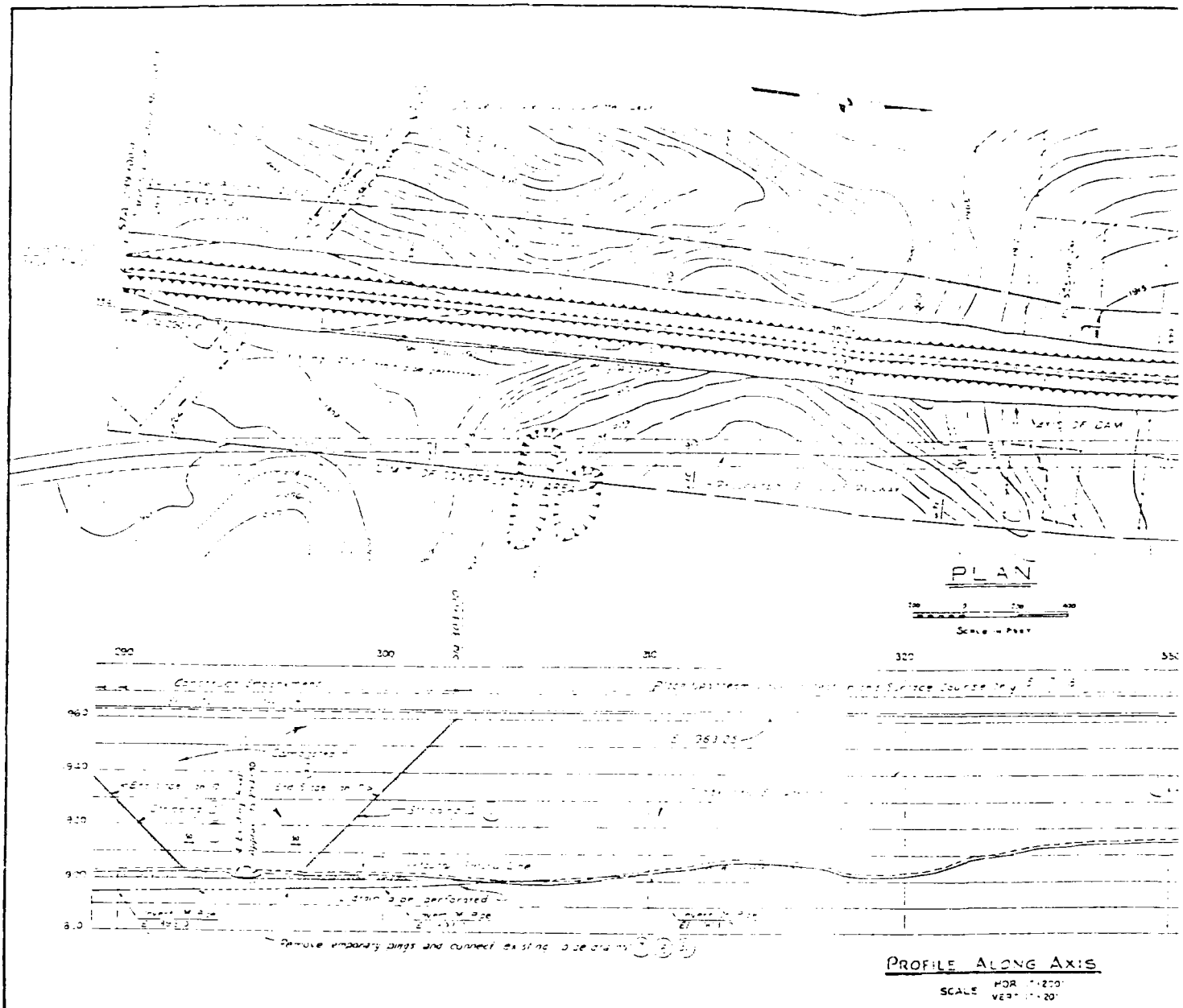
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
OFFICE OF THE DISTRICT ENGINEER
GALVESTON, TEXAS

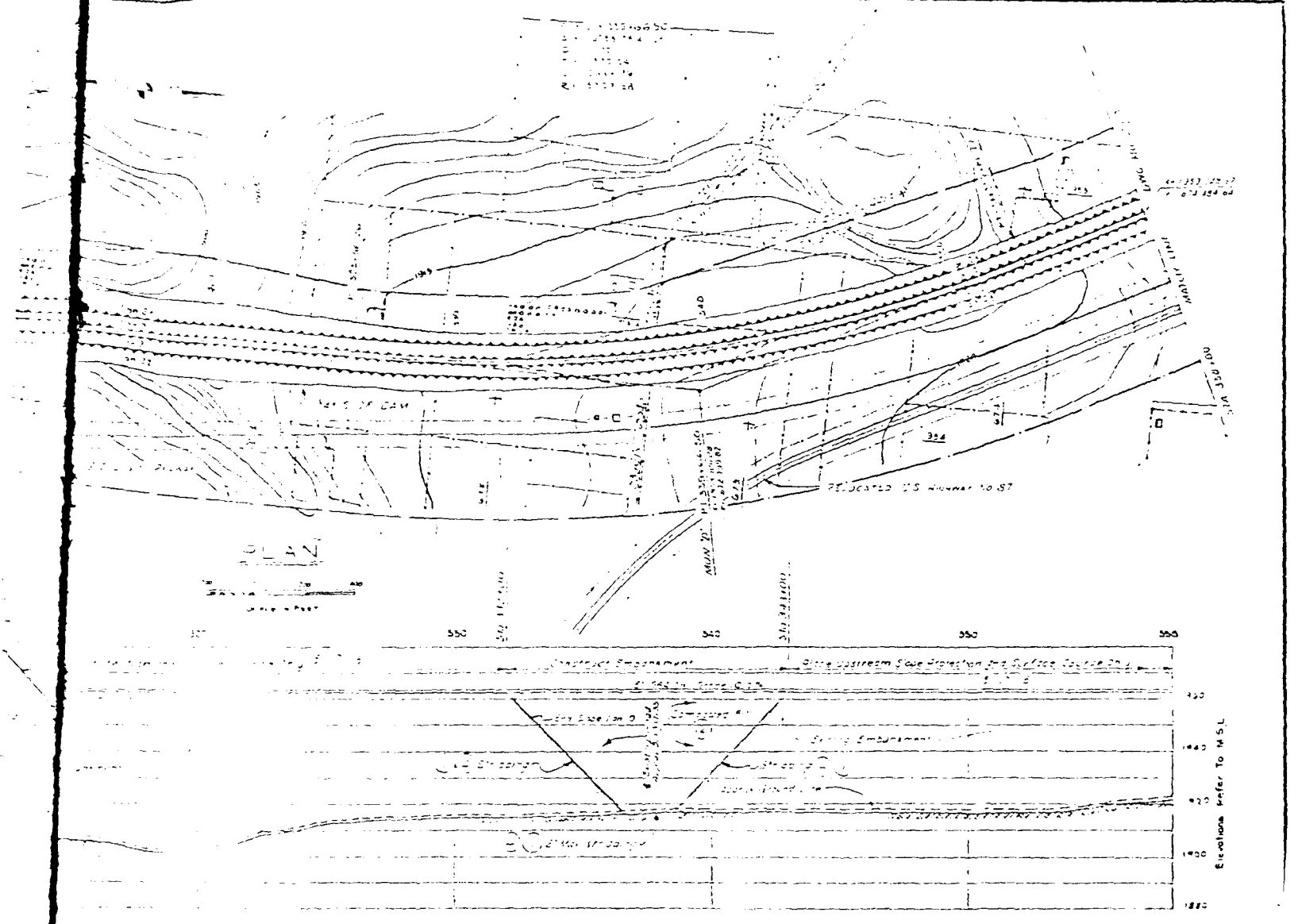
COLORADO RIVER BASIN, TEXAS
SAN ANGELO DAM AND RESERVOIR
NORTH CONCHO RIVER, TEXAS

EMBANKMENT
PLAN AND PROFILE - III

PLATE 11

20/5


PLAN
Scale in Feet
PROFILE ALONG AXIS
SCALE



NOTES

See Dwg No 20/8 for sections and details of embankment, drainage and riprap.

Figures in circles thus (2) indicate item number under which payment will be made.

For soil information, see Dwgs Nos 10/11 through 10/13.

For relationship between embankment and service spillway see Dwg No 20/6.

RECORD DRAWING
AS BUILT

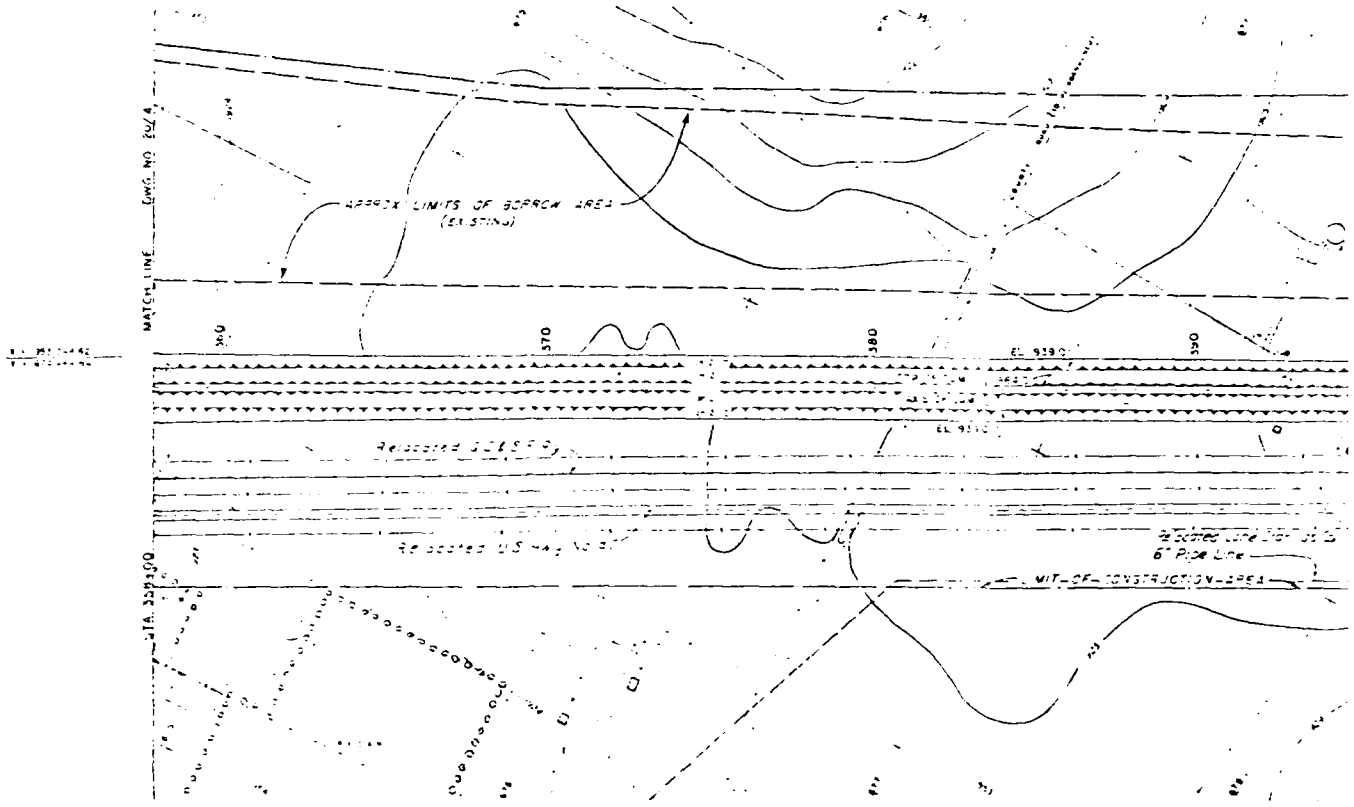
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
OFFICE OF THE DISTRICT ENGINEER
GALVESTON, TEXAS

COLORADO RIVER BASIN, TEXAS
SAN ANGELO DAM AND RESERVOIR
NORTH CONCHO RIVER, TEXAS

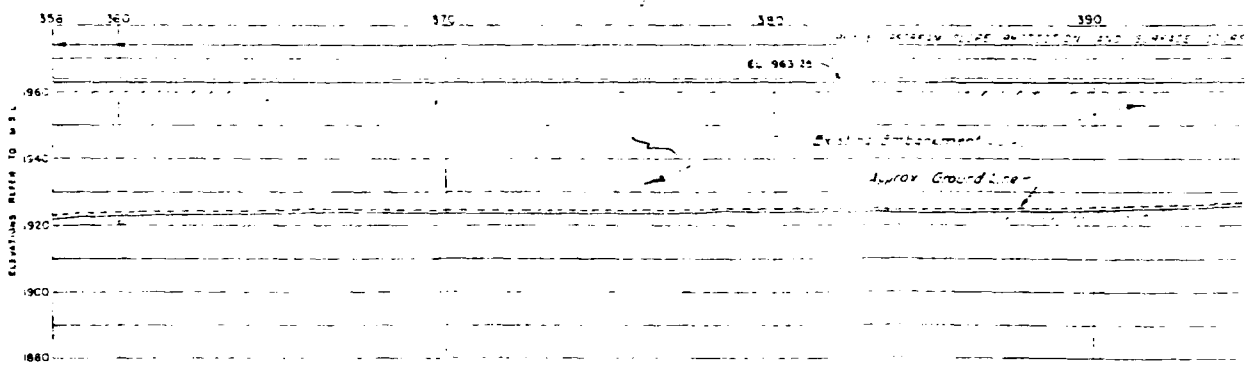
EMBANKMENT
PLAN AND PROFILE - II

PLATE 19

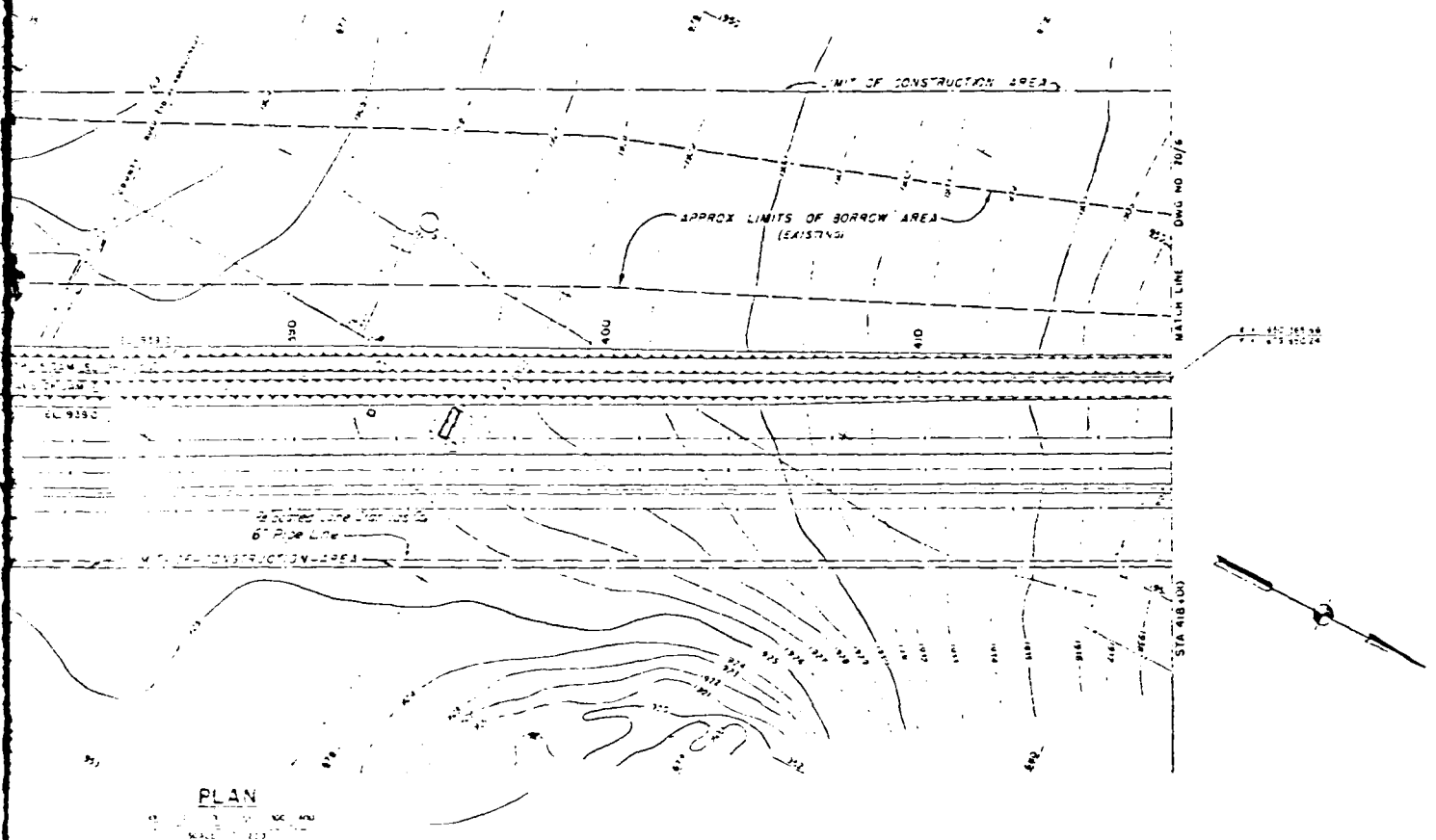
20/4



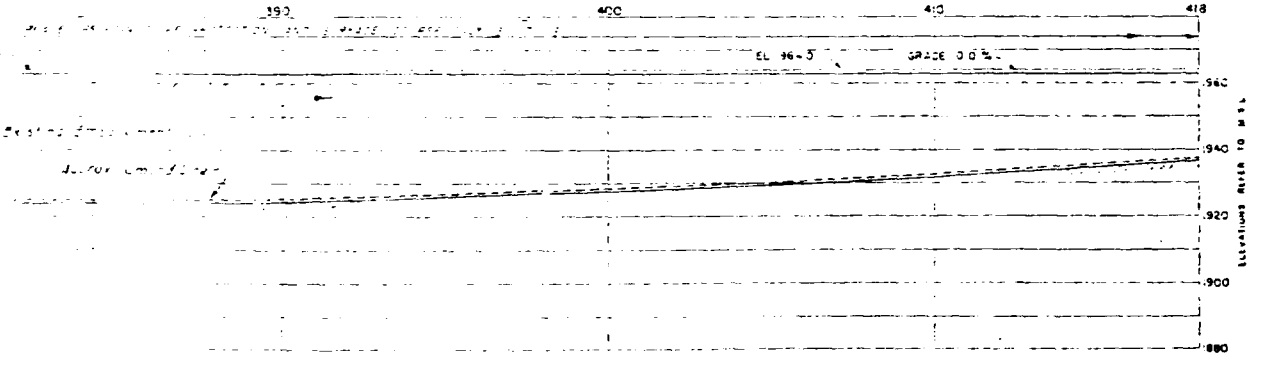
PLAN



PROFILE ALONG AXIS



PLAN



PROFILE ALONG AXIS

Note

Figures in circles, thus (1), indicates item number under which payment will be made

For Sections and Details of Embankment see Drawing No 20.9

For Soil Information see Drawing No 20.1, 20.2 & 20.3

For relationship between embankment and Borrow Area see Drawing No 20.6

RECORD DRAWING
AS BUILT

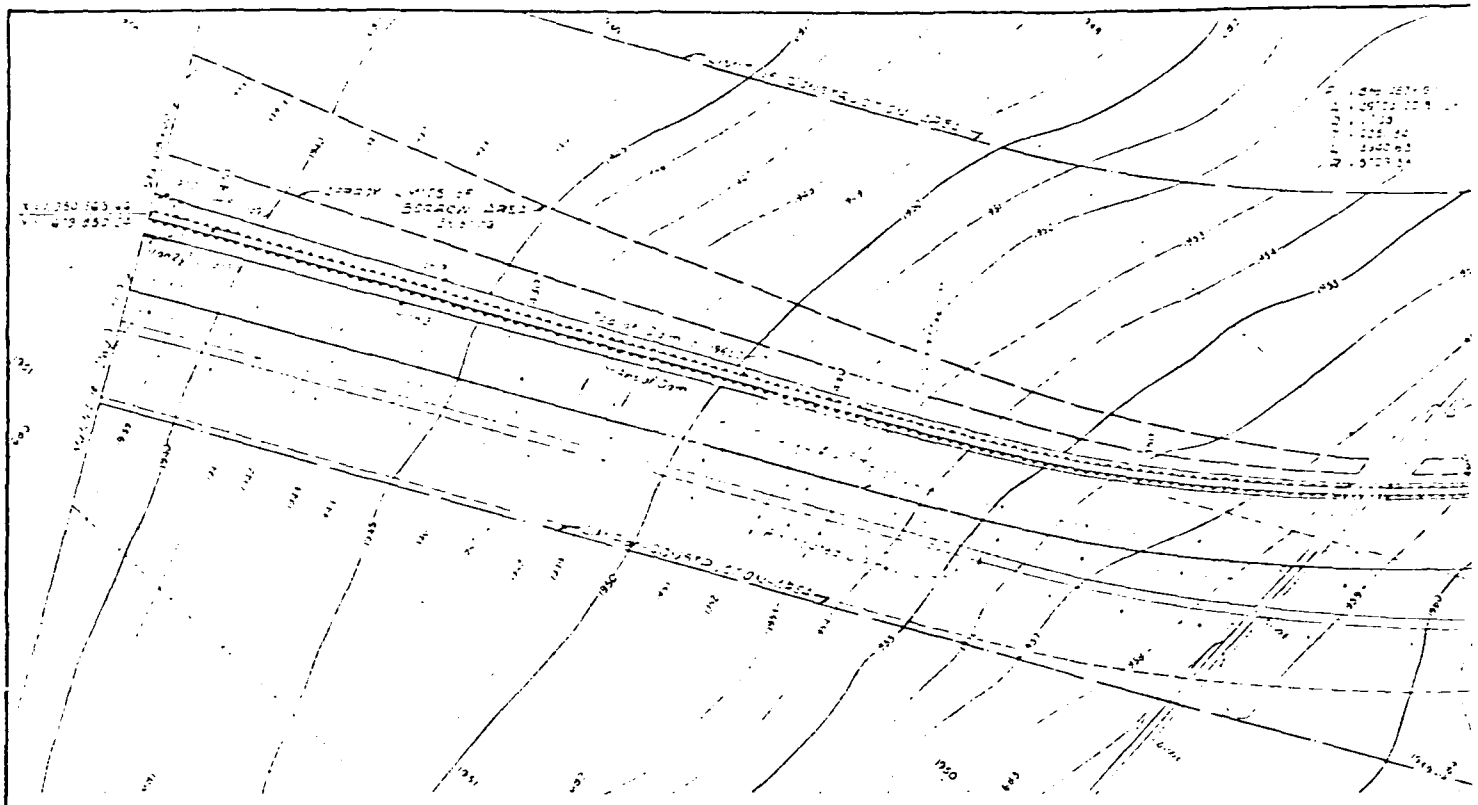
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
OFFICE OF THE DISTRICT ENGINEER
GALVESTON, TEXAS

COLORADO RIVER BASIN, TEXAS
SAN ANGELO DAM AND RESERVOIR
NORTH CONCHO RIVER, TEXAS

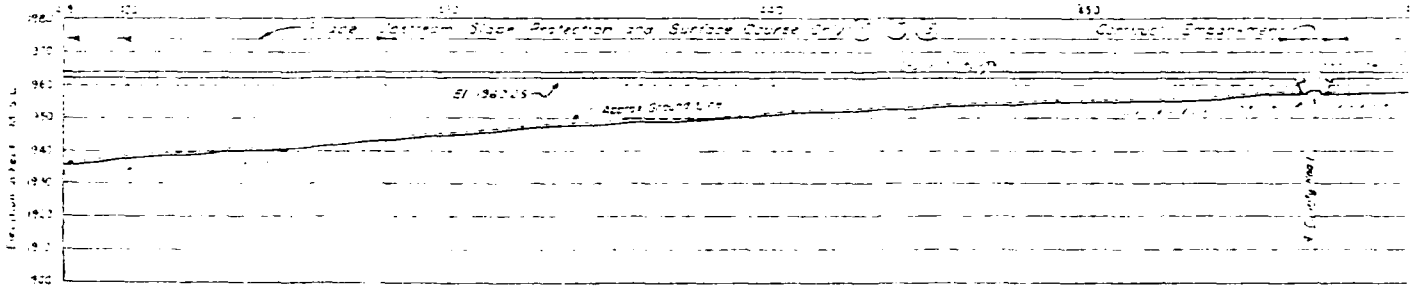
EMBANKMENT
PLAN AND PROFILE - V

PLATE 20

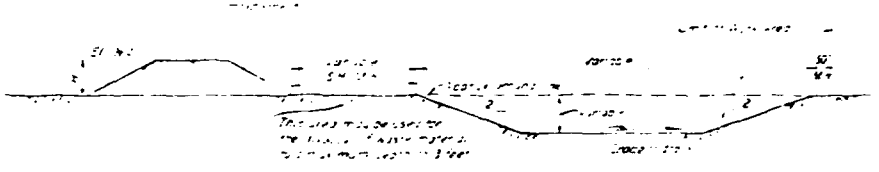
20/5



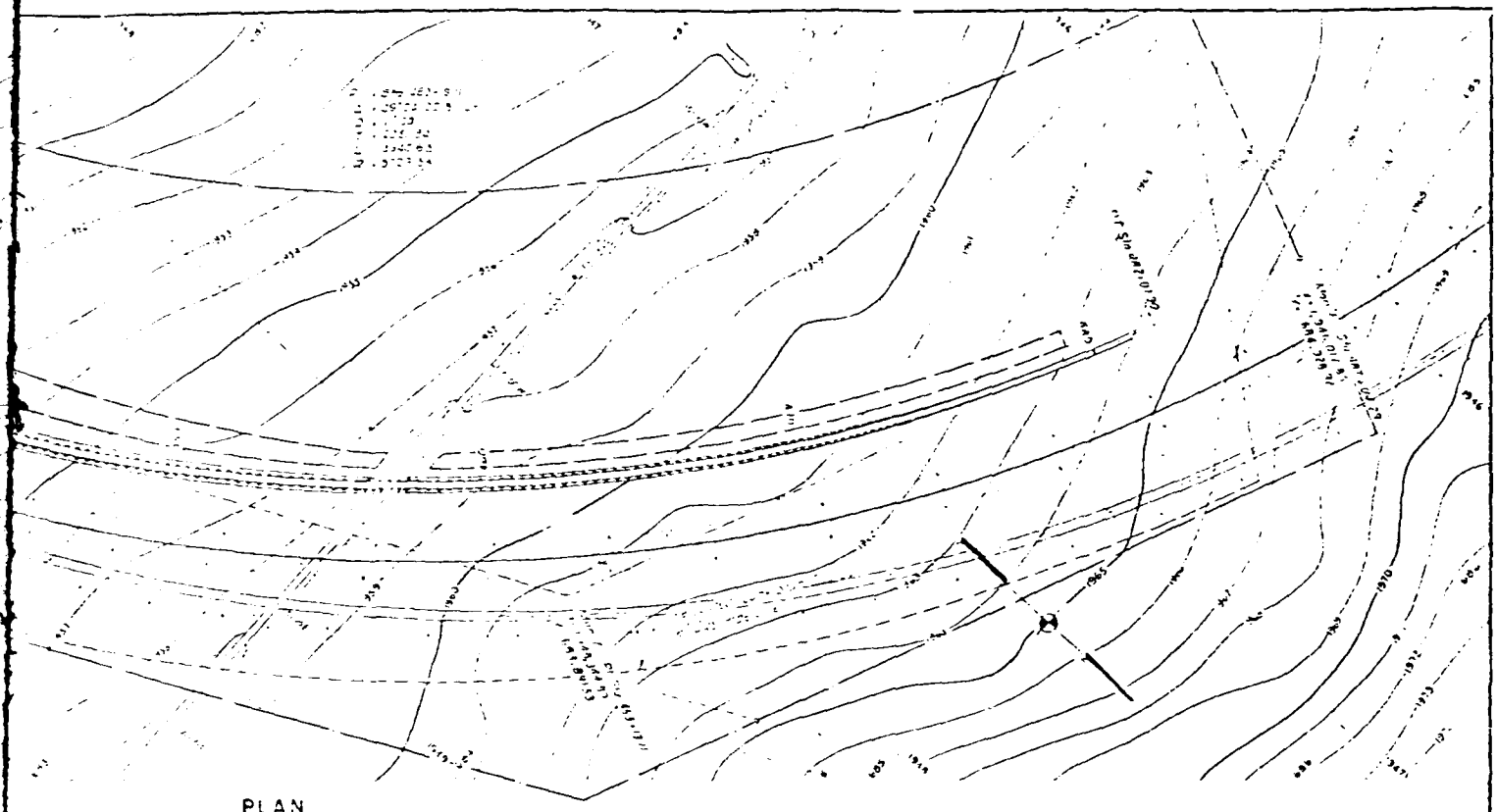
PLAN



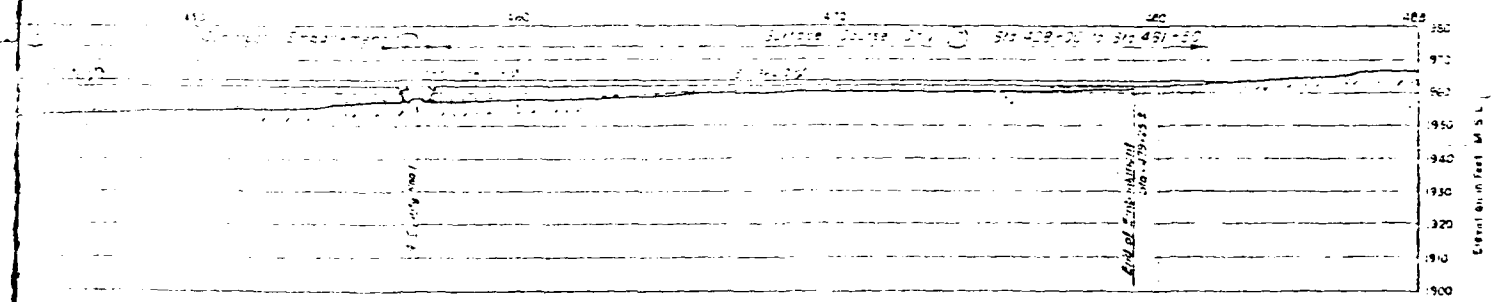
PROFILE ALONG AXIS



TYPICAL SECTION THRU BORROW AREA



PLAN



PROFILE ALONG AXIS

RECORD DRAWING
AS BUILT

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
OFFICE OF THE DISTRICT ENGINEER
GALVESTON, TEXAS

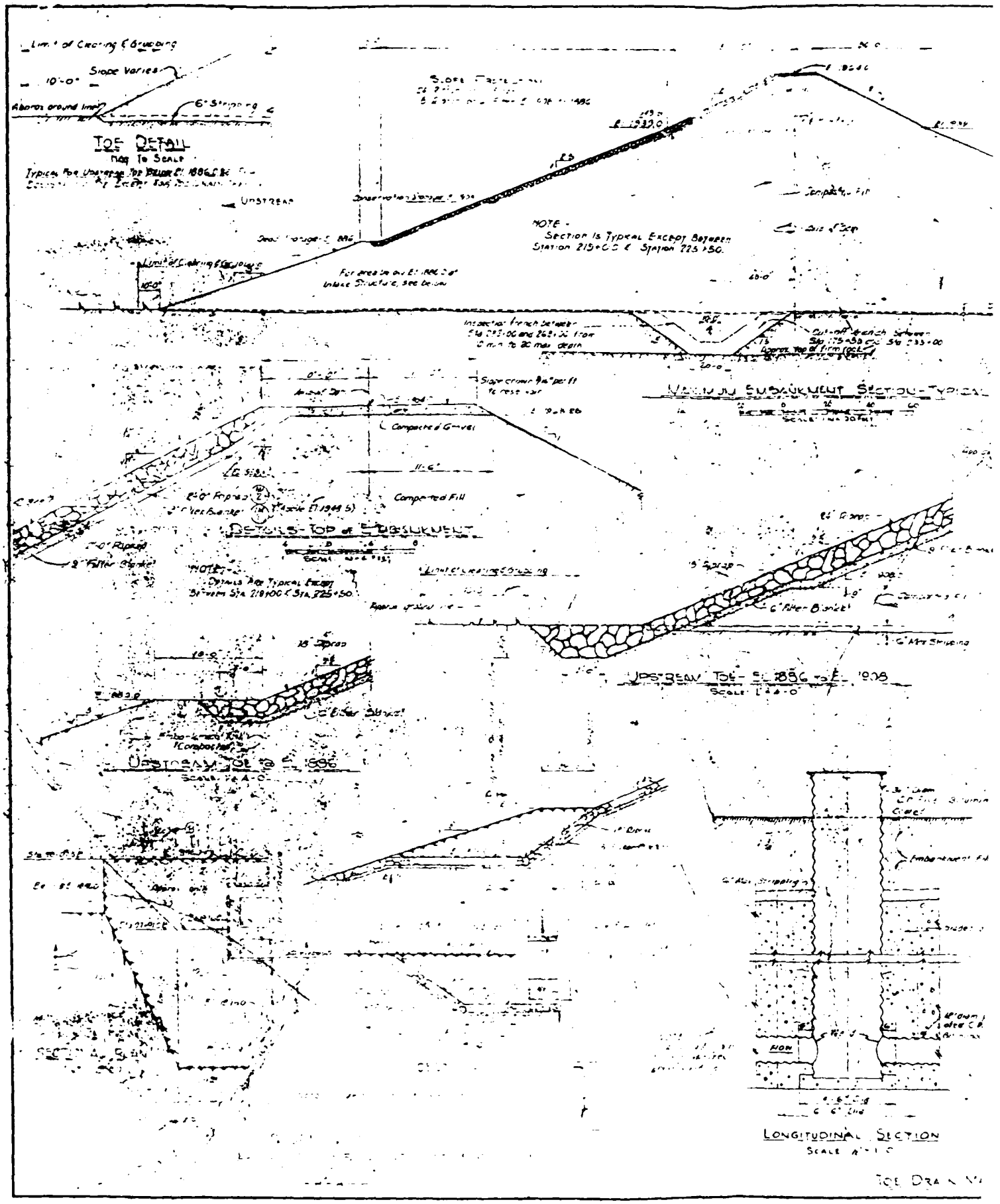
COLORADO RIVER BASIN, TEXAS
SAN ANGELO DAM AND RESERVOIR
NORTH CONCHO RIVER, TEXAS

EMBANKMENT
PLAN AND PROFILE - XII

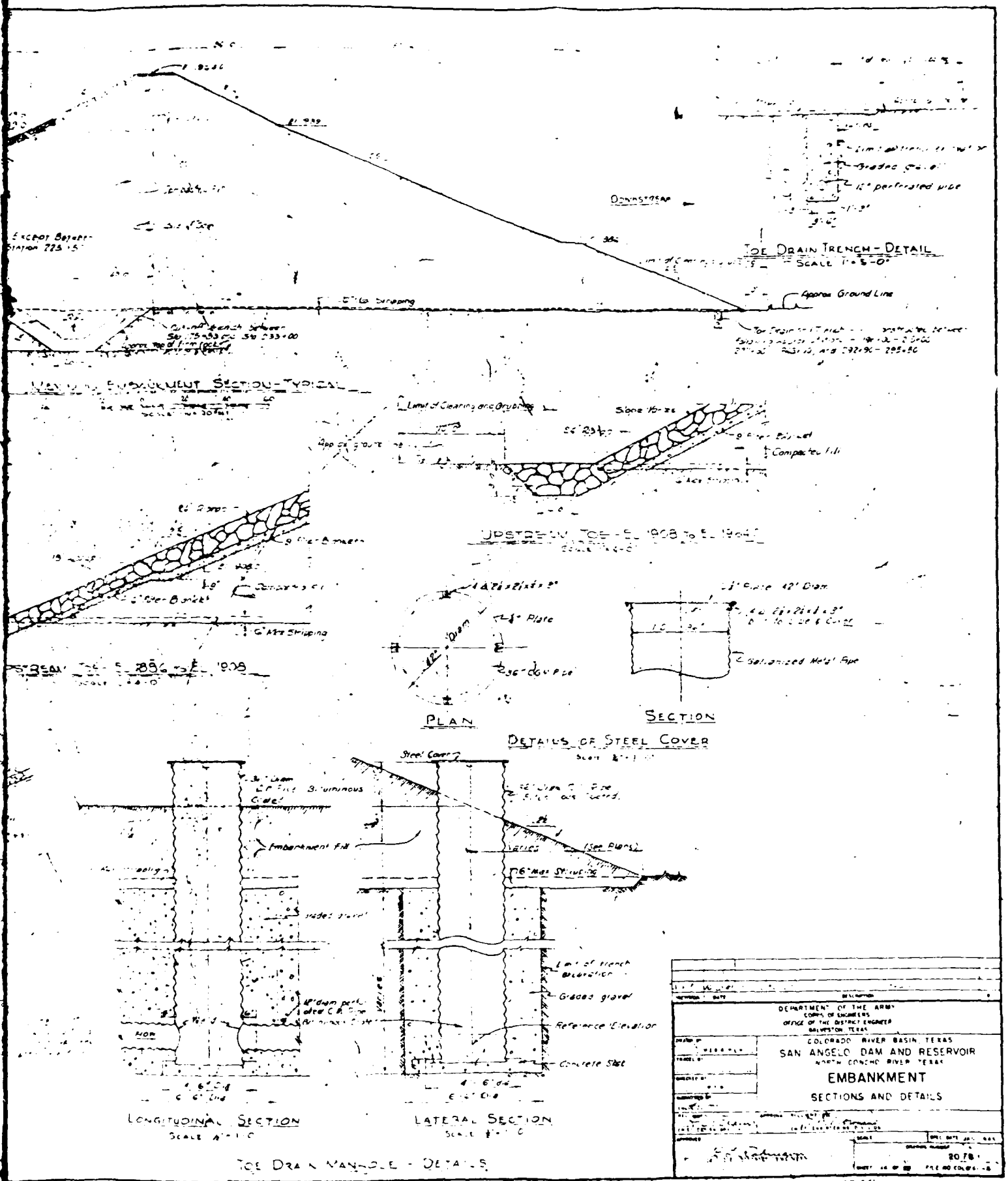
PLATE 21

20/6

THIS DRAWING SUPERSEDES DWG. 20/6


Limit of Clearing & Grubbing
Slope Varies
10'-0"
Abandon ground line?
6" Stripping
TOE DETAIL
Not To Scale
UNSTREAM
NOTE -
Section is Typical Except Between
Station 219+00 & Station 225+50.
Compacted Fill
60'-0"
Slope crown 3/4" per ft
Compacted Gravel
11'-6"
2'-0" Riprap
2' Filter Blanket
DETAILS TOP of SUBSEQUENT
NOTE -
Details Are Typical Except
Between Sta 218+00 & Sta 225+50
SUBSEQUENT SECTION - TYPICAL
SCALE: 1"=20'-0"
6" Filter Blanket
6" Mtn Stripping
UPSTREAM TOE - EL 1886 to EL 1908
SCALE: 1"=4'-0"
UPSTREAM TOE @ EL 1886
SCALE: 1"=4'-0"
LONGITUDINAL SECTION
SCALE 1"=10'-0"

TOE DRAIN



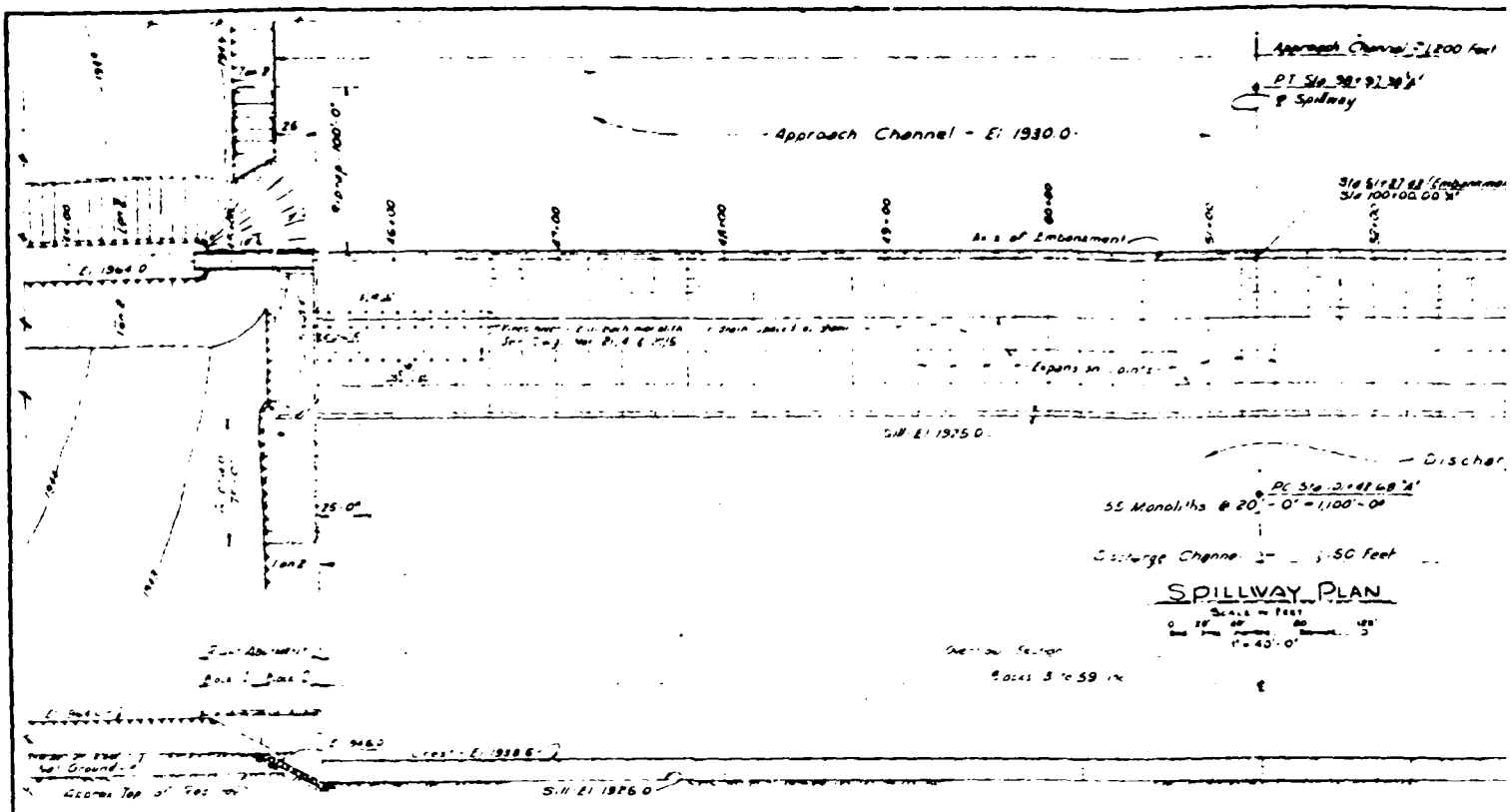
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
OFFICE OF THE DISTRICT ENGINEER
GALVESTON, TEXAS

COLORADO RIVER BASIN, TEXAS
SAN ANGELO DAM AND RESERVOIR
NORTH CONCHO RIVER, TEXAS

EMBANKMENT
SECTIONS AND DETAILS

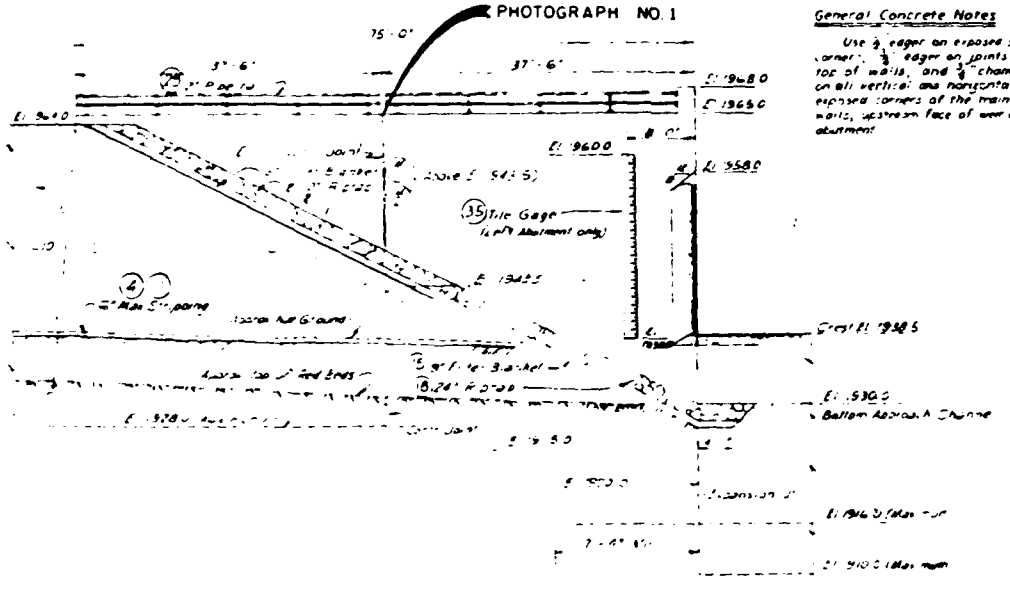
20,781

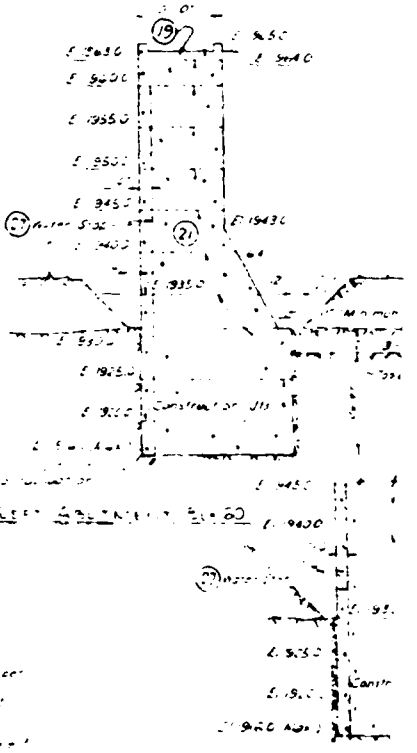
PLATE 22



DOWNSTREAM SECTIONAL ELEVATION

PHOTOGRAPH NO. 1



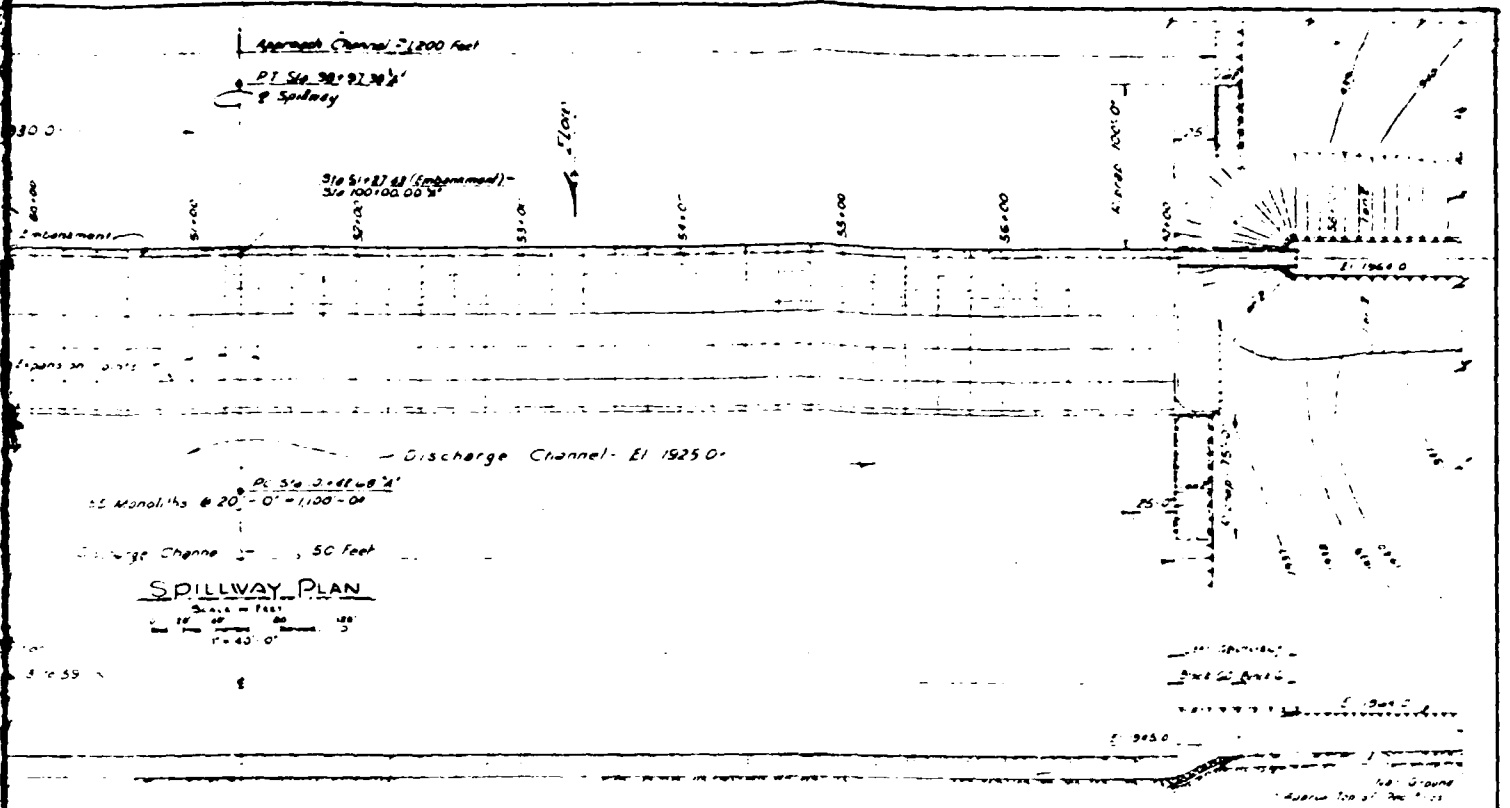


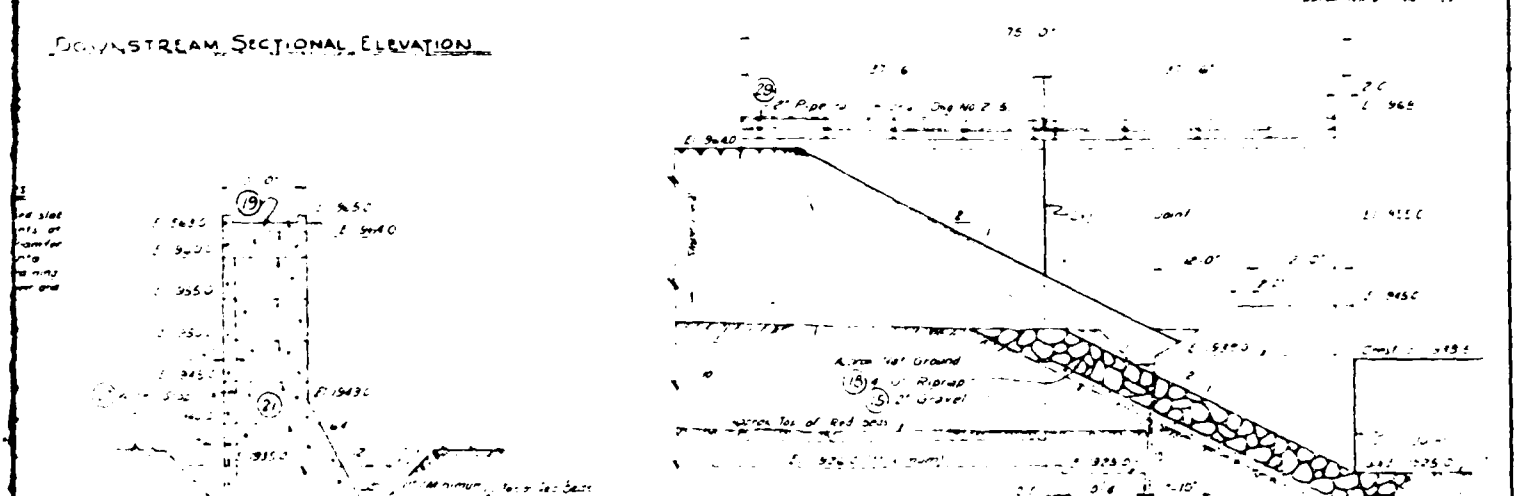
UPSTREAM SECTIONAL ELEVATION
LEFT ABUTMENT

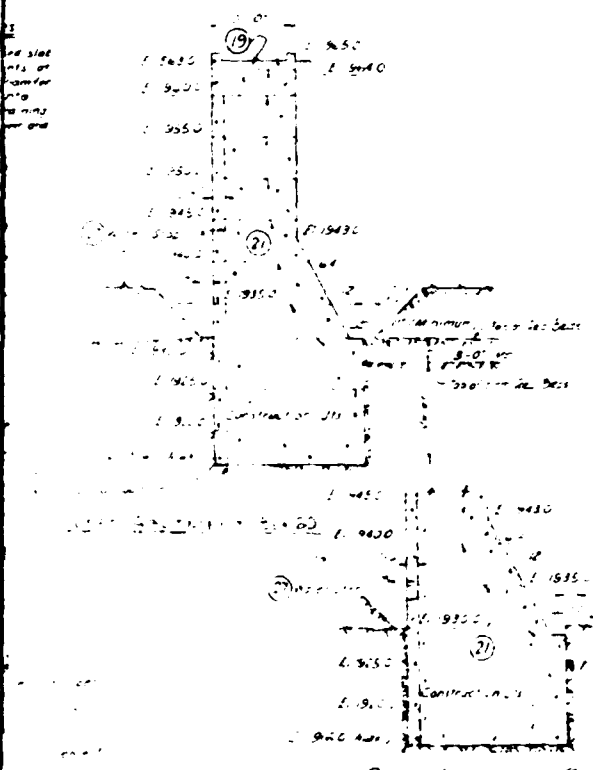
General Concrete Notes

Use ¾ edger on exposed slot corners, ½ edger on joints at top of walls, and ¾ chamfer on all vertical and horizontal exposed corners of the training walls, upstream face of wall and abutment

MAXIMUM NON-OVERFLOW





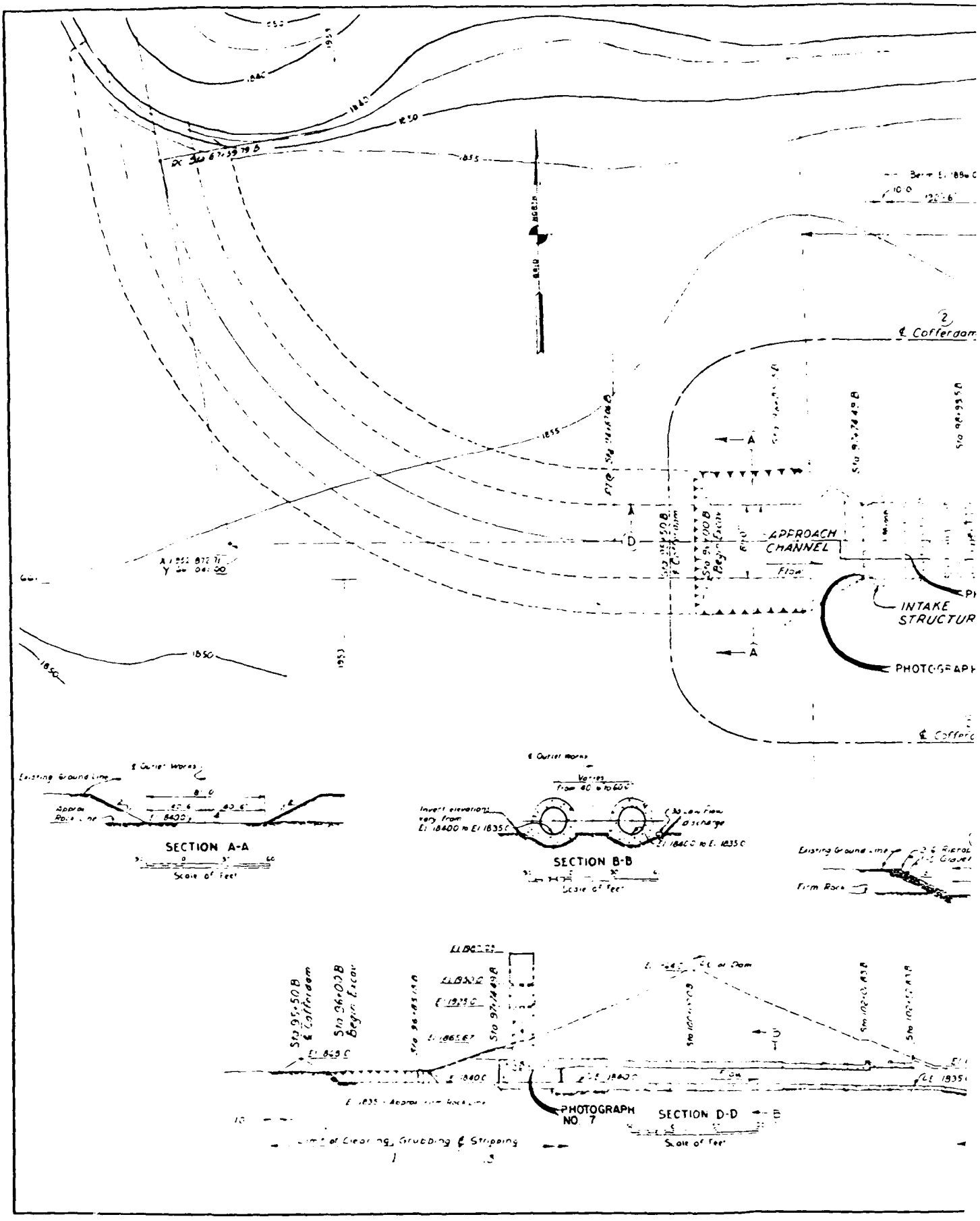


DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
OFFICE OF THE DISTRICT ENGINEER
GALVESTON TEXAS

COLORADO RIVER BASIN, TEXAS
SAN ANGELO DAM AND RESERVOIR
NORTH CONCHO RIVER, TEXAS

SPILLWAY
PLAN AND ELEVATIONS

PLATE 23


APPROACH CHANNEL
INTAKE STRUCTUR
PHOTOGRAPH NO. 7
SECTION A-A
SECTION B-B
SECTION D-D
Scale of Feet
Existing Ground Line
Firm Rock
Limits of Clearing, Grubbing & Stripping

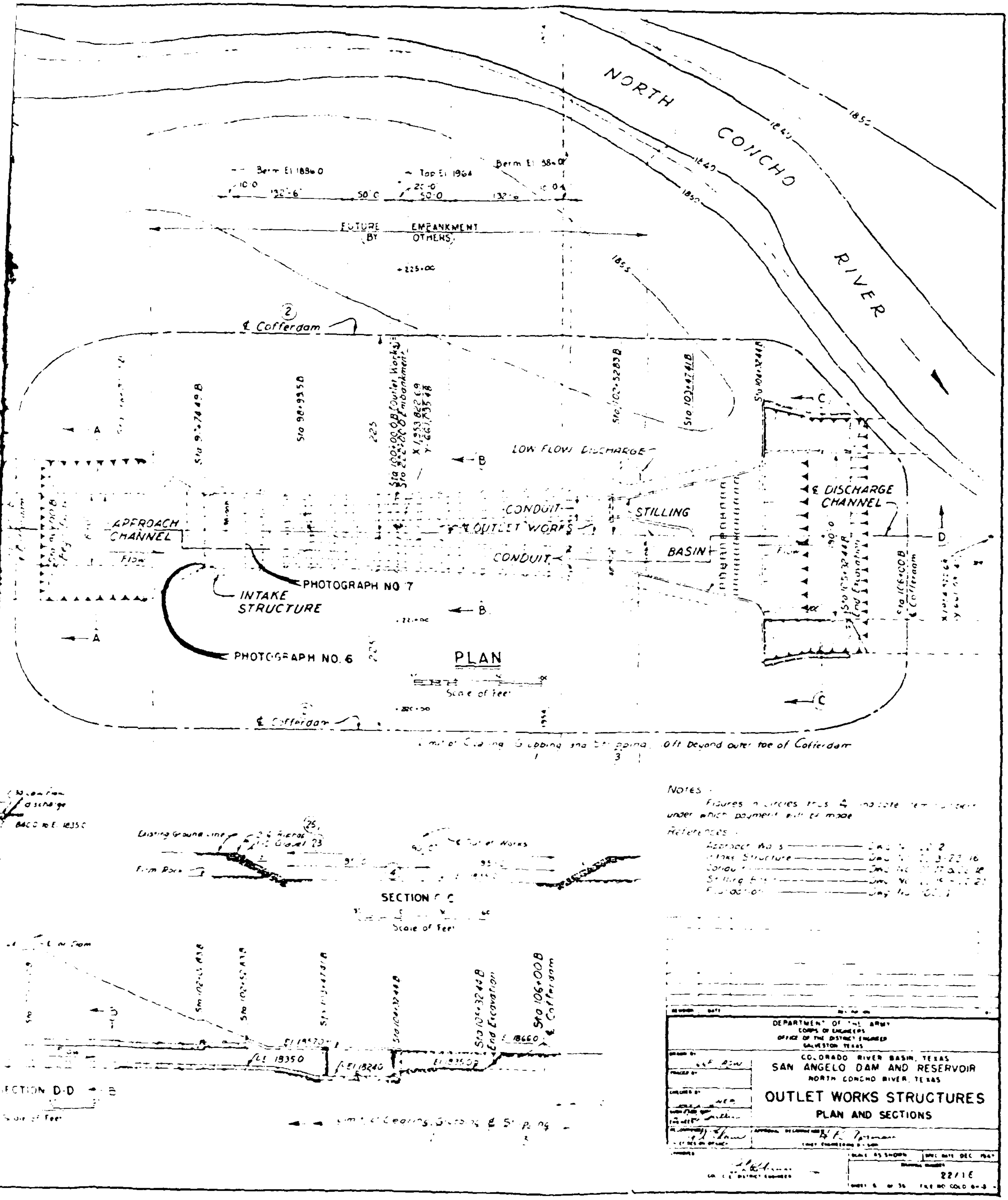
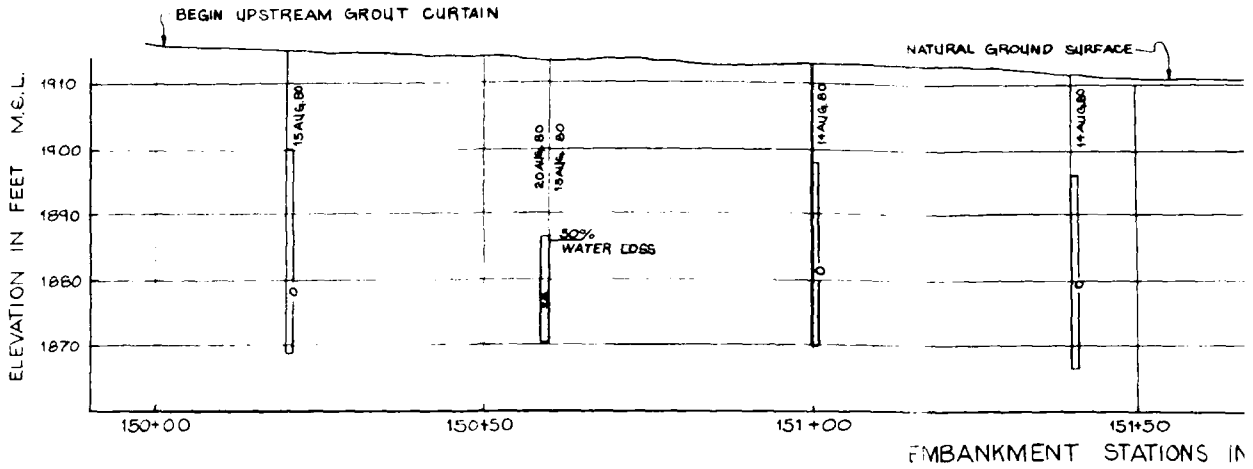
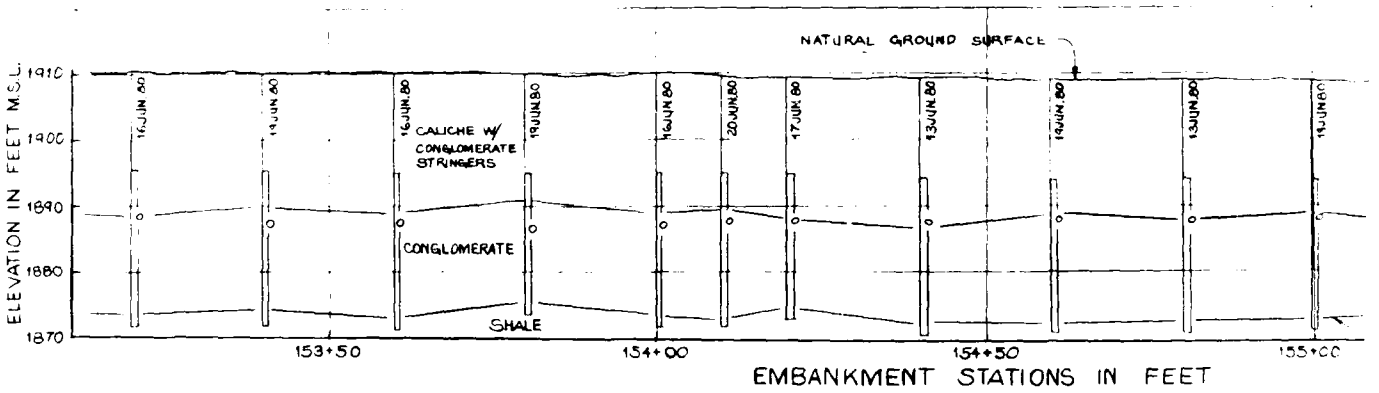
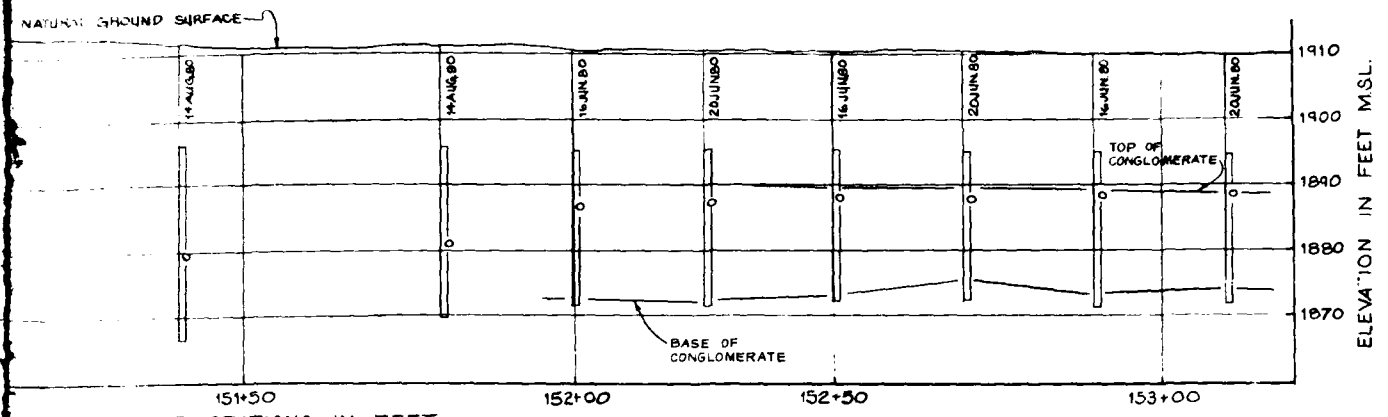
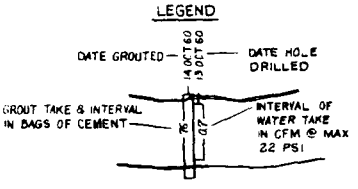

NORTH CONCHO RIVER
FUTURE EMBANKMENT BY OTHERS
Berm El 1880.0
Top El 1964
℄ Cofferdam
LOW FLOW DISCHARGE
APPROACH CHANNEL
CONDUIT
℄ OUTLET WORKS
STILLING BASIN
℄ DISCHARGE CHANNEL
INTAKE STRUCTURE
PHOTOGRAPH NO. 7
PHOTOGRAPH NO. 6
PLAN
Scale of Feet
SECTION C-C
Scale of Feet
SECTION D-D
Sta 106+00 B ℄ Cofferdam
Notes
References
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
OFFICE OF THE DISTRICT ENGINEER
GALVESTON, TEXAS
COLORADO RIVER BASIN, TEXAS
SAN ANGELO DAM AND RESERVOIR
NORTH CONCHO RIVER, TEXAS
OUTLET WORKS STRUCTURES
PLAN AND SECTIONS
SCALE AS SHOWN
22/1E

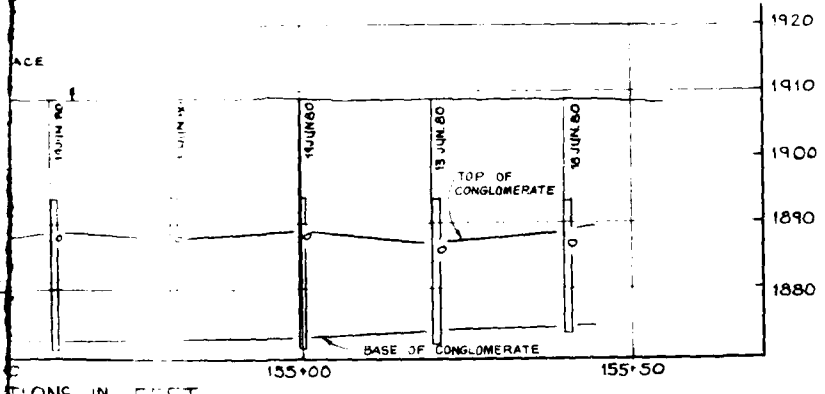
PLATE 24


BEGIN UPSTREAM GROUT CURTAIN
NATURAL GROUND SURFACE
ELEVATION IN FEET M.S.L.
1910
1900
1890
1880
1870
15 AUG 80
20 AUG 80
15 AUG 80
14 AUG 80
14 AUG 80
50% WATER LOSS
150+00
150+50
151+00
151+50
EMBANKMENT STATIONS IN


NATURAL GROUND SURFACE
ELEVATION IN FEET M.S.L.
1910
1900
1890
1880
1870
16 JUN 80
19 JUN 80
16 JUN 80
19 JUN 80
16 JUN 80
20 JUN 80
17 JUN 80
13 JUN 80
19 JUN 80
13 JUN 80
19 JUN 80
CALICHE W/ CONGLOMERATE STRINGERS
CONGLOMERATE
SHALE
153+50
154+00
154+50
155+00
EMBANKMENT STATIONS IN FEET







GENERAL NOTES.

1960-1963 GROUT DATA
STA. 175+00 TO 207+40
TOTAL LINEAR FEET DRILLED IN THE CONGLOMERATE ZONE ---------- 9318.0 FT.
TOTAL BAGS OF CEMENT USED IN THE GROUTING PROJECT ---------- 1609.5

1980 GROUT DATA
STA 150+50 TO 174+60
TOTAL LINEAR FEET DRILLED IN THE CONGLOMERATE ZONE ---------- 5965.0 FT.
TOTAL BAGS OF CEMENT USED IN THE GROUTING PROJECT ---------- 233.0

SEE PLATE 36 FOR PLAN VIEW OF GROUT CURTAIN.

DRILLING AND GROUTING WAS DONE IN ACCORDANCE WITH THE STOP GROUTING SPLIT SPACING METHOD.

ENGINEERING DIVISION
GEOTECHNICAL BRANCH

U.S. ARMY ENGINEER DISTRICT, FORT WORTH
CORPS OF ENGINEERS
FORT WORTH, TEXAS

DESIGNED BY:
DRAWN BY:
REVIEWED BY

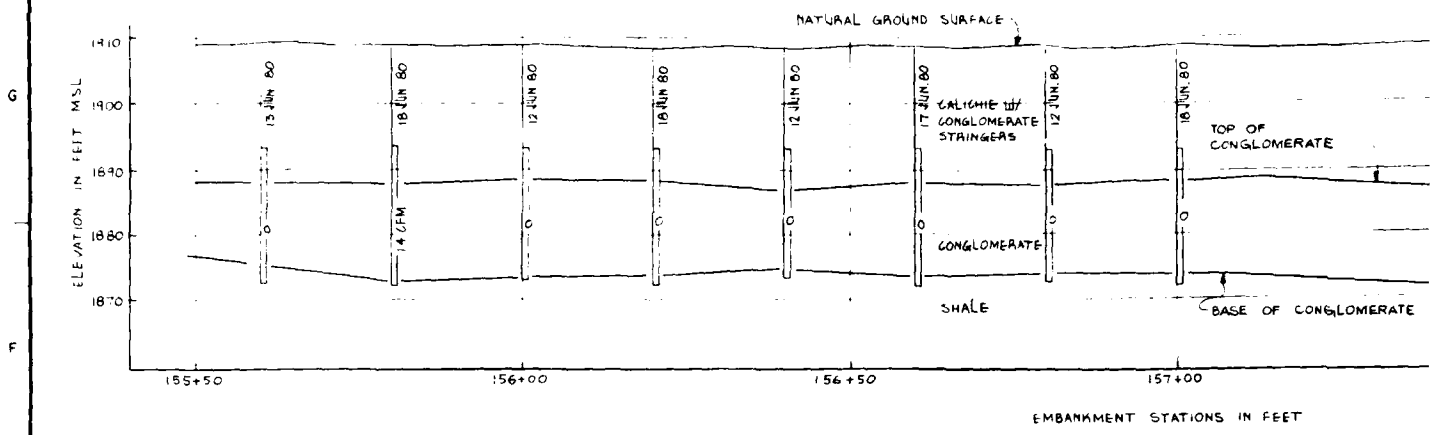
OC FISHER LAKE
NORTH CONCHO RIVER, TEXAS

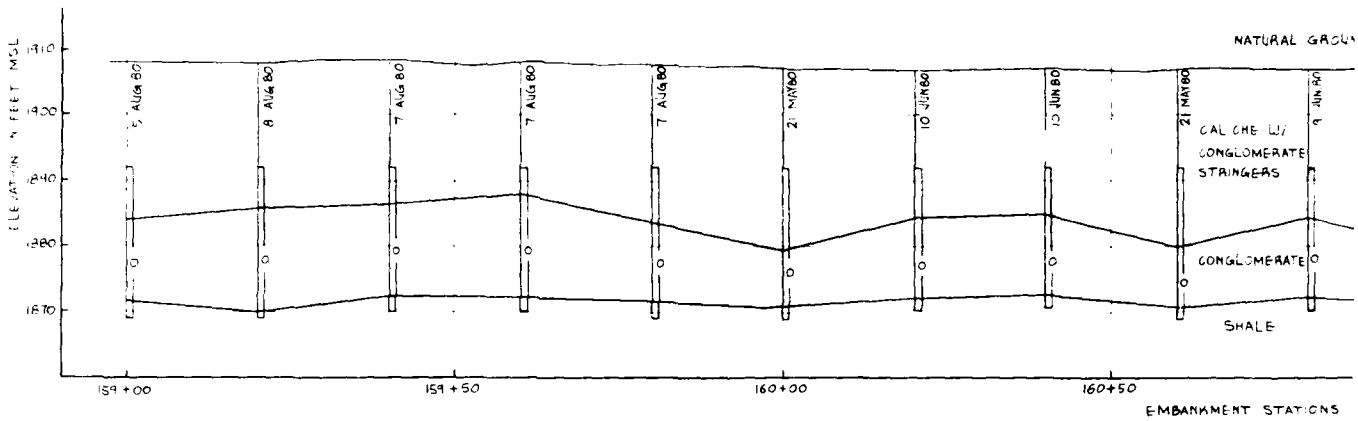
AS-BUILT SECTION

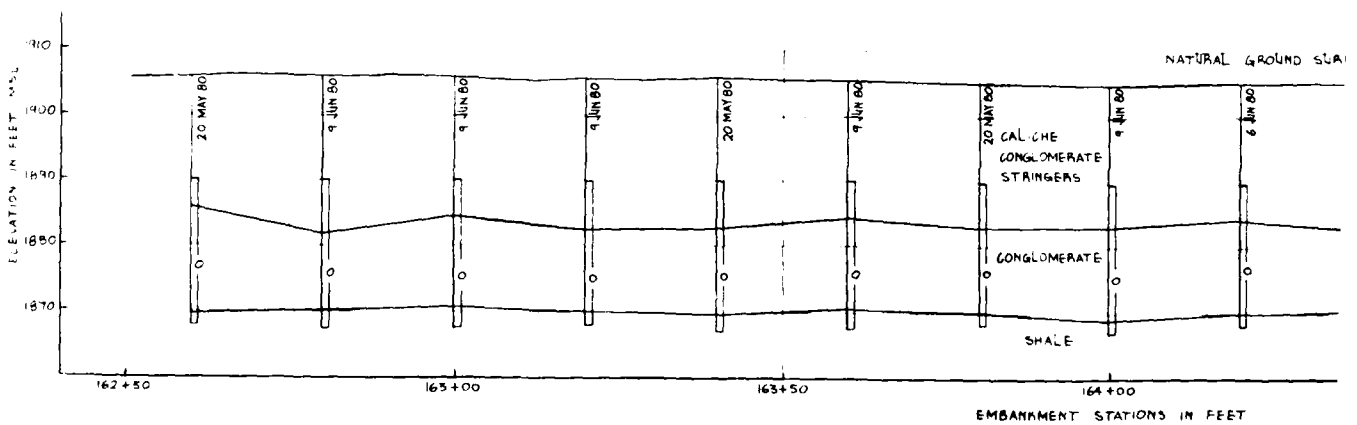
FOUNDATION GROUTING-RIGHT ABUTMENT
STA 150+50 TO 155+50
SCALE AS SHOWN

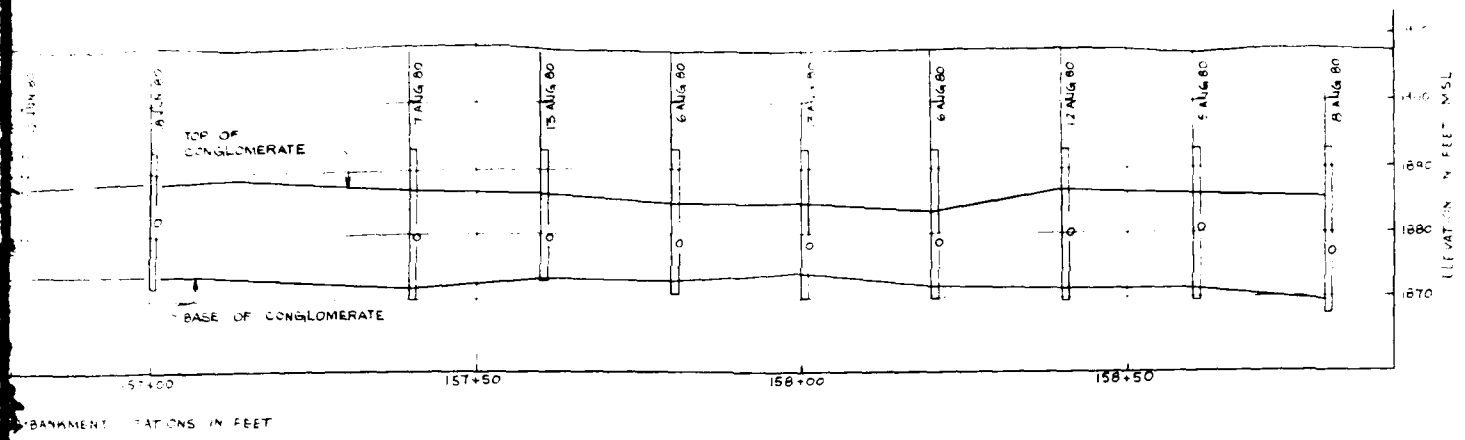
U.S. ARMY ENGINEER DISTRICT, FORT WORTH
TO ACCOMPANY FINAL FOUNDATION REPORT

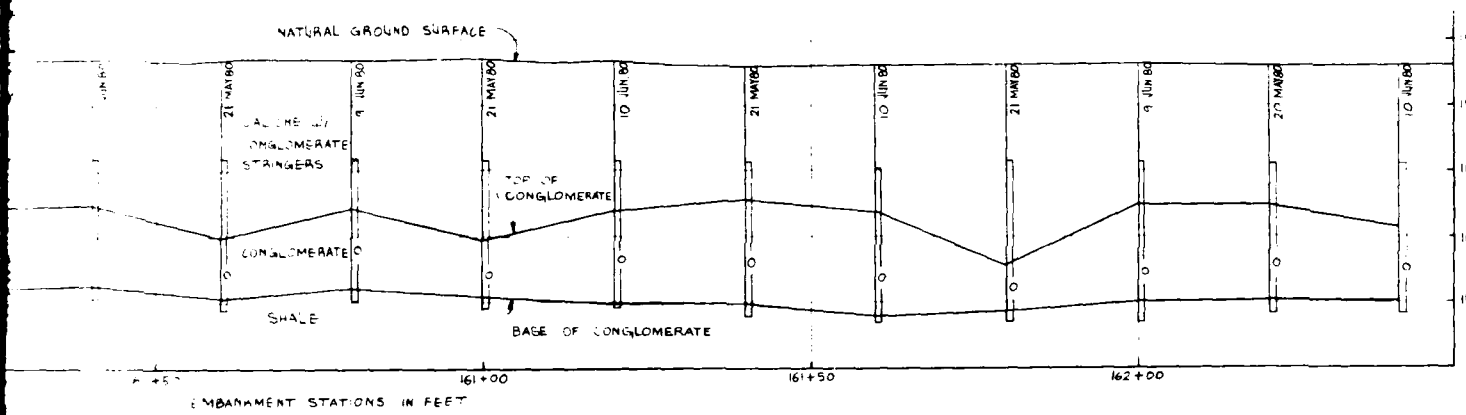
SUBMITTED BY:
SOL. NO.
DATED:
APPROVED:
CONTR NO
DRAWING NUMBER
PLATE 25
SHEET NO
OF

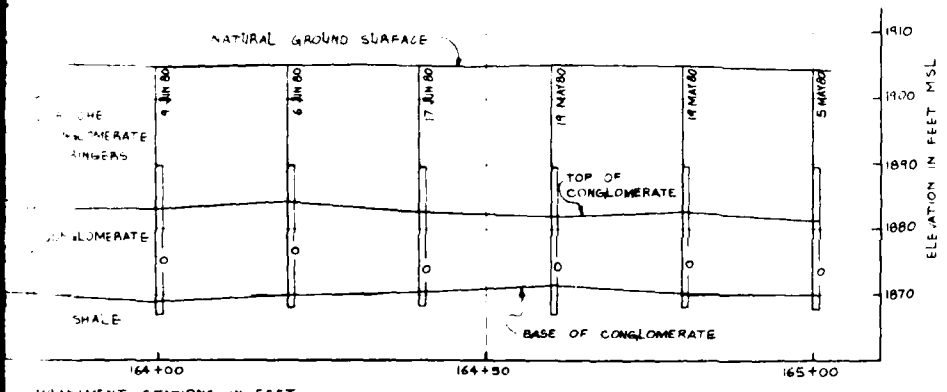

NATURAL GROUND SURFACE
ELEVATION IN FEET MSL
1910
1900
1890
1880
1870
13 JUN 80
18 JUN 80
14 CFM
12 JUN 80
18 JUN 80
12 JUN 80
17 JUN 80
CALICHE W/ CONGLOMERATE STRINGERS
12 JUN 80
18 JUN 80
TOP OF CONGLOMERATE
CONGLOMERATE
SHALE
BASE OF CONGLOMERATE
155+50
156+00
156+50
157+00
EMBANKMENT STATIONS IN FEET


NATURAL GROU
ELEVATION IN FEET MSL
1910
1900
1890
1880
1870
5 AUG 80
8 AUG 80
7 AUG 80
7 AUG 80
7 AUG 80
21 MAY 80
10 JUN 80
13 JUN 80
21 MAY 80
9 JUN 80
CALICHE W/ CONGLOMERATE STRINGERS
CONGLOMERATE
SHALE
159+00
159+50
160+00
160+50
EMBANKMENT STATIONS

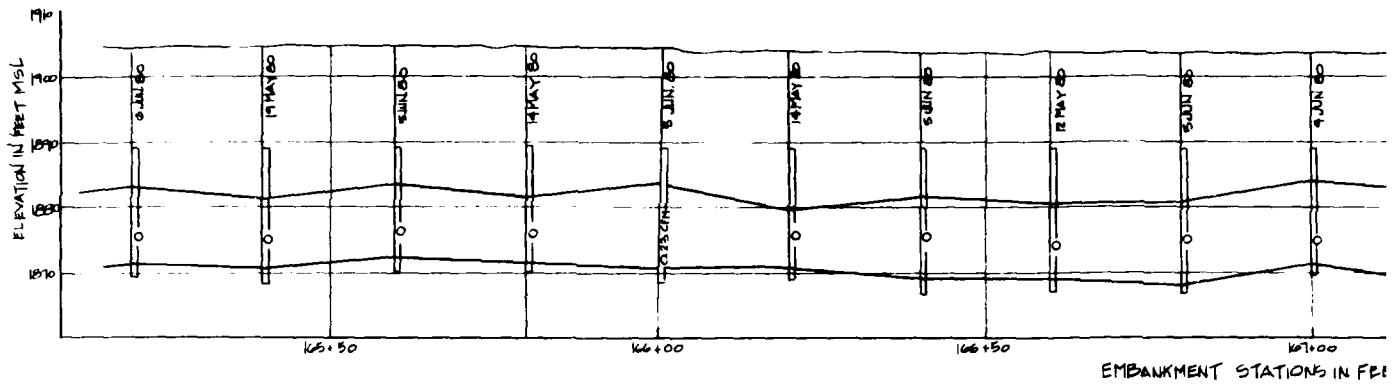

NATURAL GROUND SUR
ELEVATION IN FEET MSL
1910
1900
1890
1880
1870
20 MAY 80
9 JUN 80
9 JUN 80
9 JUN 80
20 MAY 80
9 JUN 80
20 MAY 80
9 JUN 80
6 JUN 80
CALICHE CONGLOMERATE STRINGERS
CONGLOMERATE
SHALE
162+50
163+00
163+50
164+00
EMBANKMENT STATIONS IN FEET

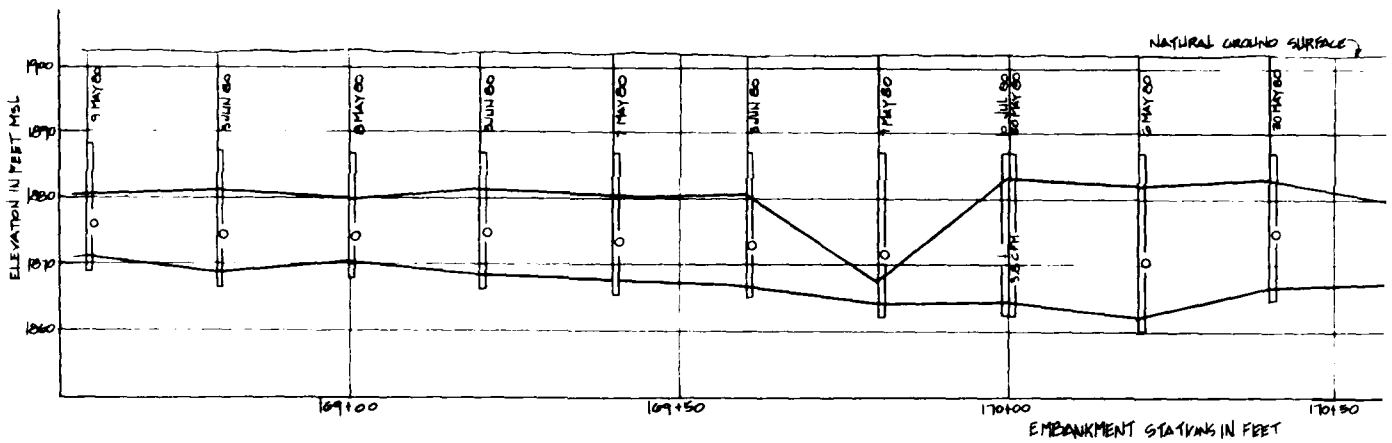


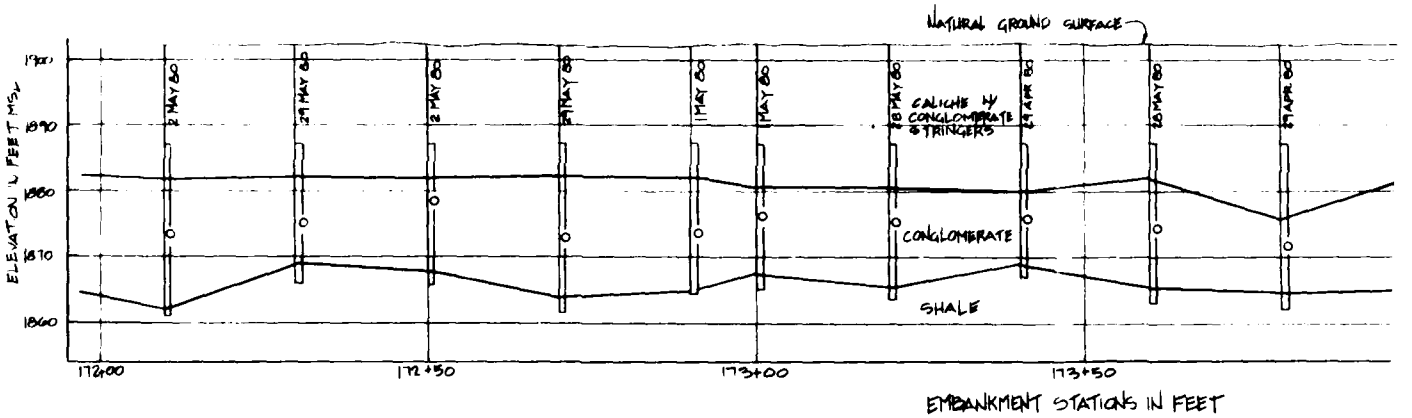


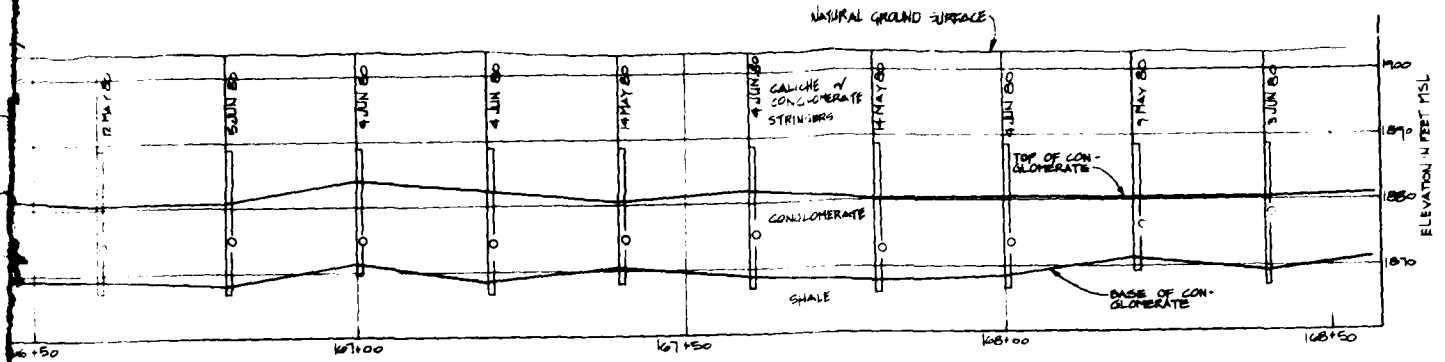


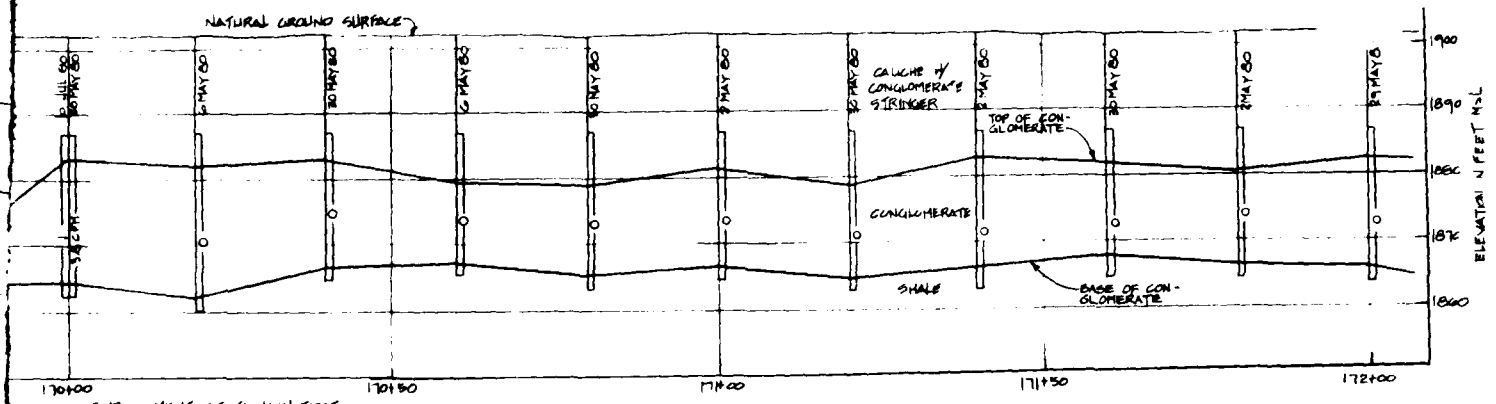
ENGINEERING DIVISION GEOTECHNICAL BRANCH	U.S. ARMY ENGINEER DISTRICT, FORT WORTH CORPS OF ENGINEERS FORT WORTH, TEXAS
DESIGNED BY	DC FISHER LAKE NORTH CONCHO RIVER, TEXAS
DRAWN BY	AS-BUILT SECTION
TRACED BY	FOUNDATION GROUTING-RIGHT ABUTMENT STA. 155+50 TO 165+50 SCALE AS SHOWN
SUBMITTED BY	U.S. ARMY ENGINEER DISTRICT, FORT WORTH TO ACCOMPANY FINAL FOUNDATION REPORT
ENGINEER	DRAWING NO. PLATE 26

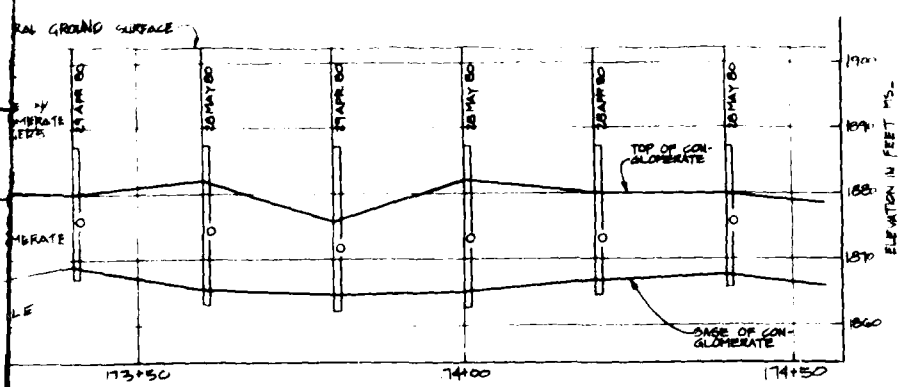

ELEVATION IN FEET MSL
1910
1900
1890
1880
1870
6 JUN 80
19 MAY 80
6 JUN 80
14 MAY 80
6 JUN 80
14 MAY 80
6 JUN 80
12 MAY 80
6 JUN 80
9 JUN 80
5.2 CFM
165+50
166+00
166+50
167+00
EMBANKMENT STATIONS IN FEET


NATURAL GROUND SURFACE
ELEVATION IN FEET MSL
1900
1890
1880
1870
1860
9 MAY 80
5 JUN 80
8 MAY 80
5 JUN 80
7 MAY 80
5 JUN 80
7 MAY 80
5 JUN 80
30 MAY 80
6 MAY 80
30 MAY 80
5.2 CFM
169+00
169+50
170+00
170+50
EMBANKMENT STATIONS IN FEET


NATURAL GROUND SURFACE
ELEVATION IN FEET MSL
1900
1890
1880
1870
1860
2 MAY 80
29 MAY 80
2 MAY 80
29 MAY 80
1 MAY 80
1 MAY 80
28 MAY 80
CALICHE W CONGLOMERATE & STRINGERS
24 APR 80
26 MAY 80
29 APR 80
CONGLOMERATE
SHALE
172+00
172+50
173+00
173+50
EMBANKMENT STATIONS IN FEET







ENGINEERING DIVISION
GEOTECHNICAL BRANCH

U.S. ARMY ENGINEER DISTRICT, FORT WORTH
CORPS OF ENGINEERS
FORT WORTH, TEXAS

DESIGNED BY:
DRAWN BY:
REVIEWED BY
SUBMITTED BY:
ENGINEER:

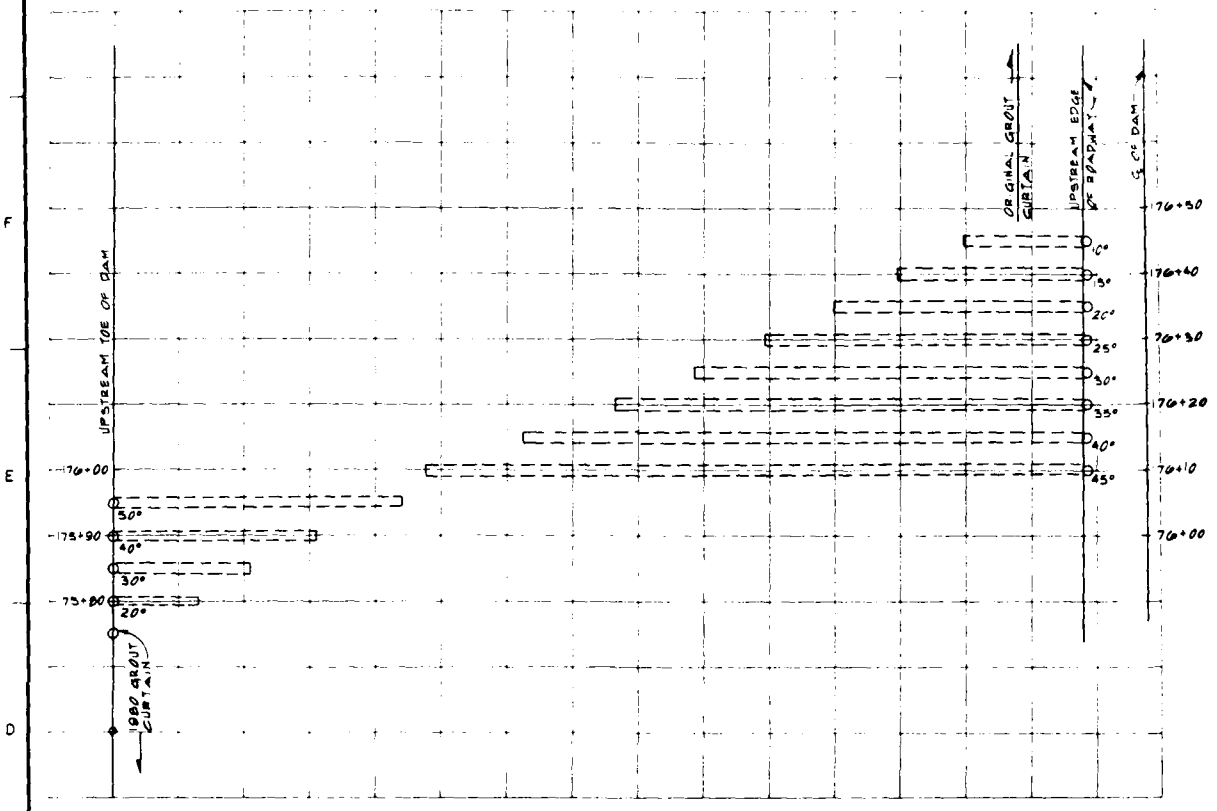
OC FISHER LAKE
NORTH CONCHO RIVER, TEXAS

AS-BUILT SECTION

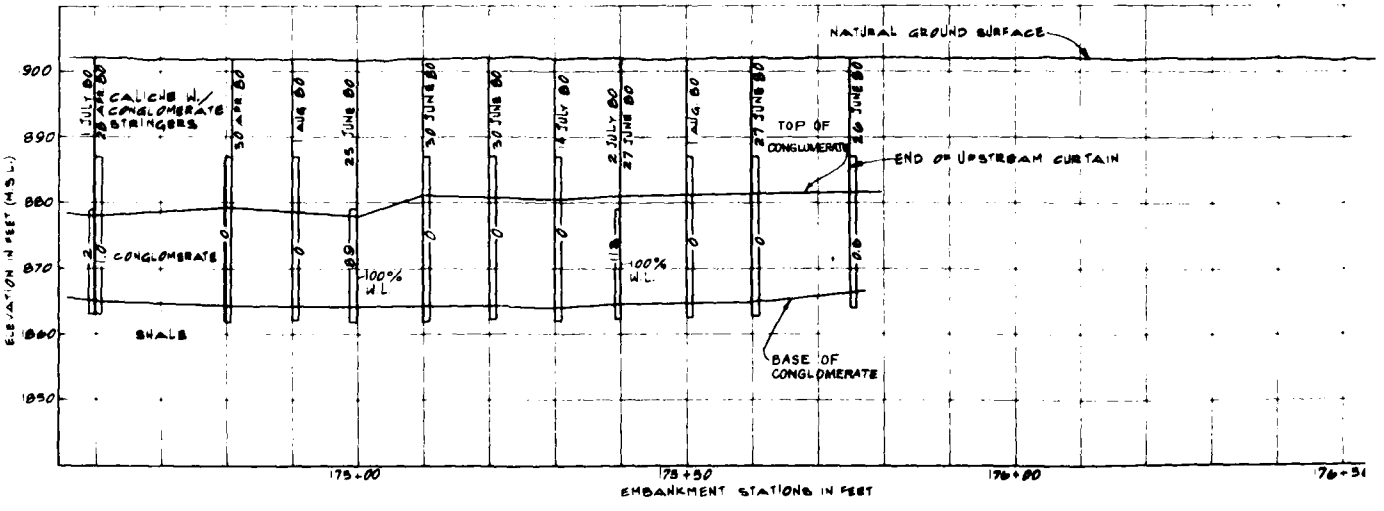
FOUNDATION GROUTING-RIGHT ABUTMENT
STA 165+50 TO 174+50
SCALE AS SHOWN

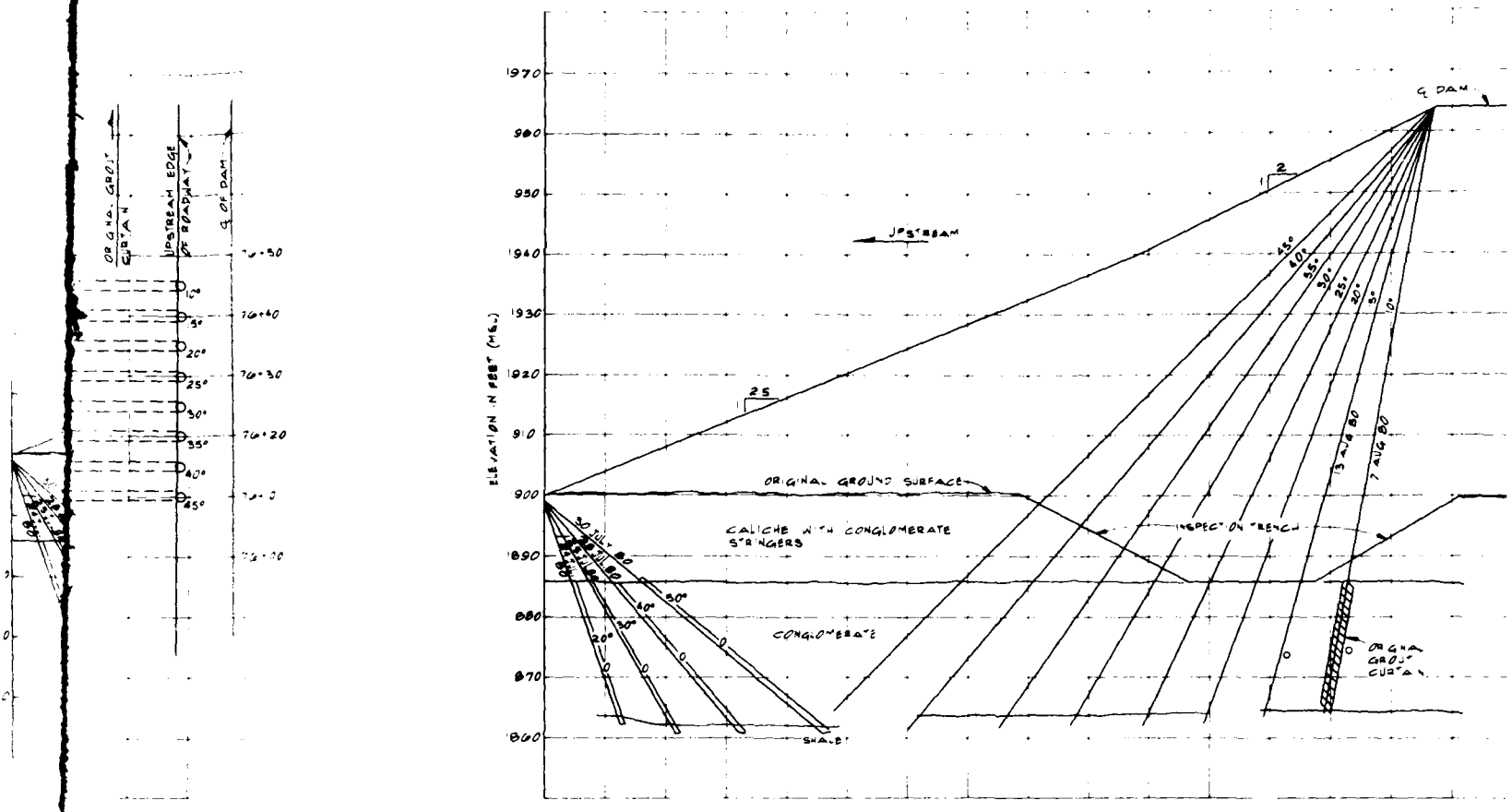
U.S. ARMY ENGINEER DISTRICT, FORT WORTH
TO ACCOMPANY FINAL FOUNDATION REPORT

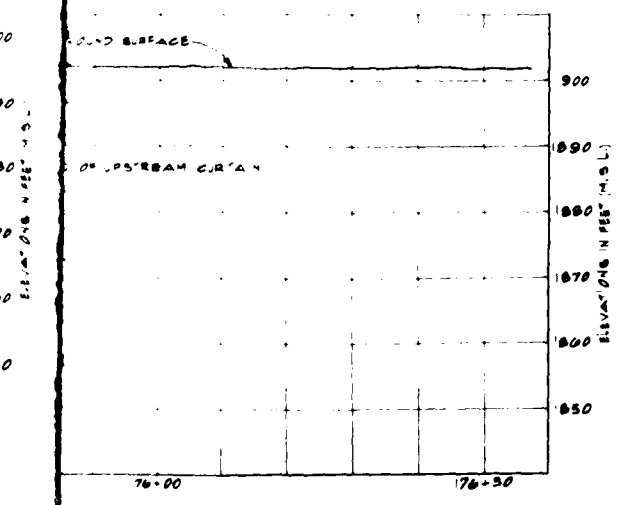
SOL. NO.
DATED:
CONTR NO.
DRAWING NUMBER
PLATE 27
SHEET NO
OF


UPSTREAM TOE OF DAM
176+00
175+90
175+80
50°
40°
30°
20°
1980 GROUT CURTAIN
ORIGINAL GROUT CURTAIN
UPSTREAM EDGE OF ROADWAY
℄ OF DAM
176+50
176+40
176+30
176+20
176+10
176+00
0°
5°
20°
25°
30°
35°
40°
45°

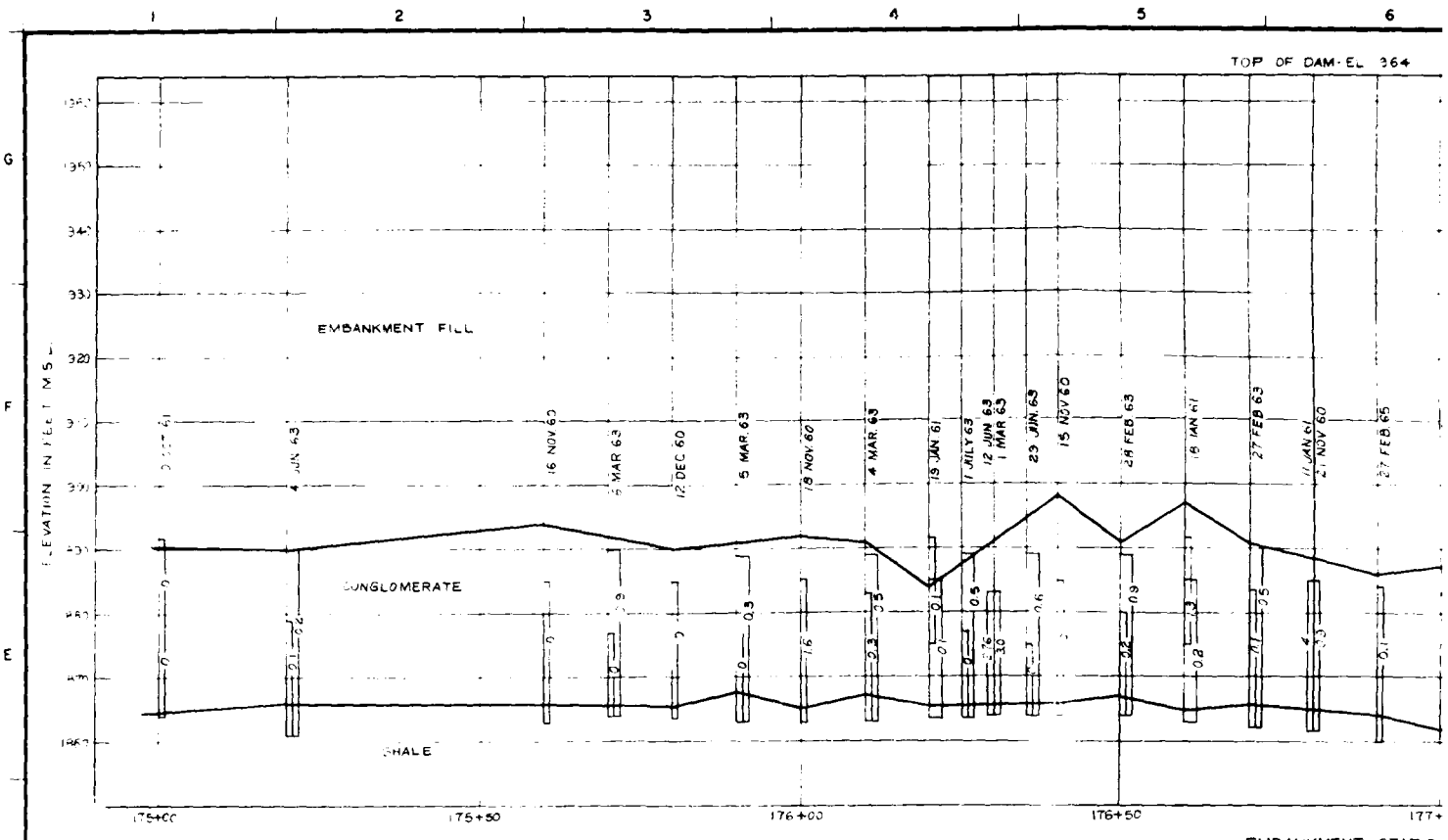
PLAN VIEW

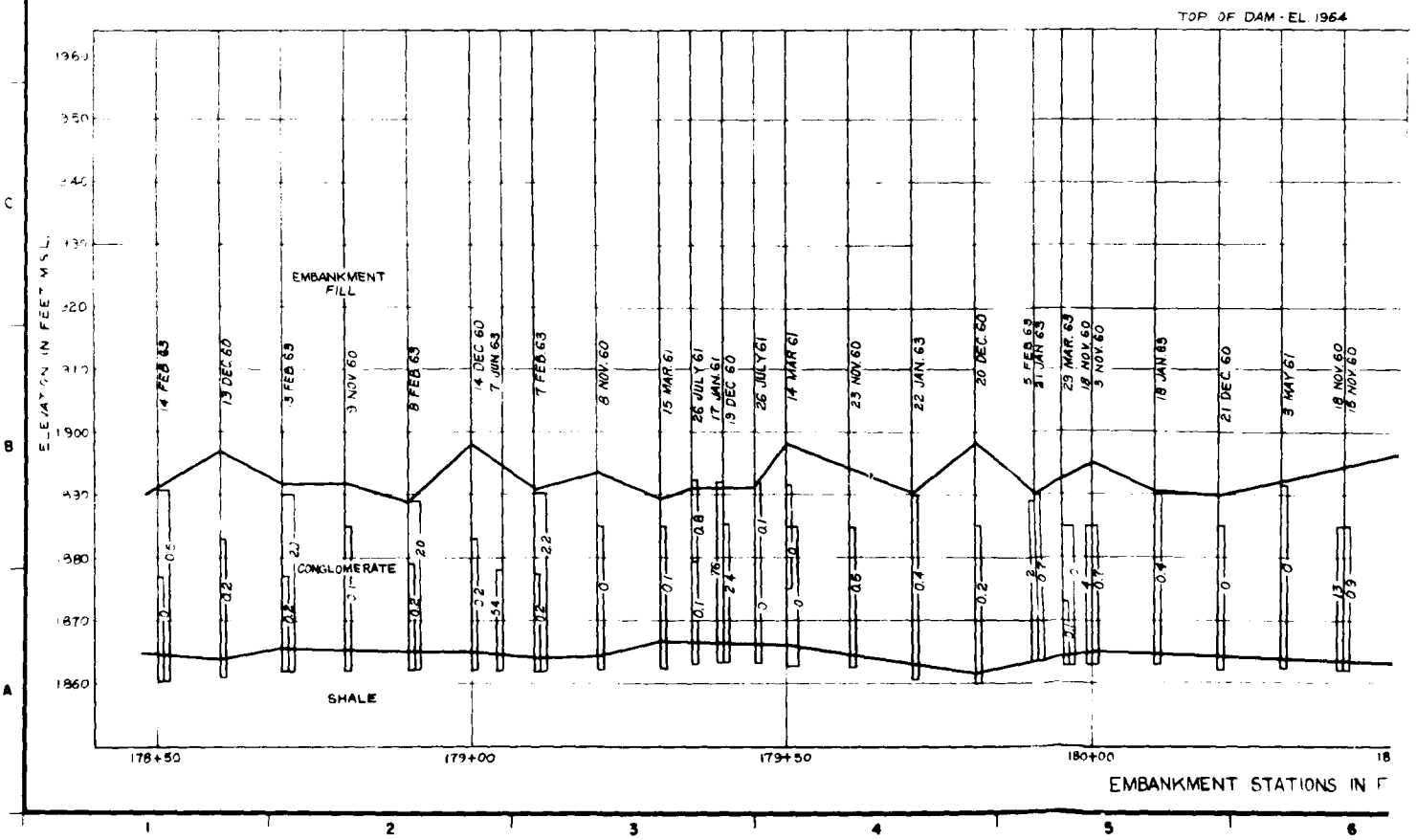

NATURAL GROUND SURFACE
ELEVATION IN FEET (M.S.L.)
900
890
880
870
860
850
CALICHE W/ CONGLOMERATE STRINGERS
CONGLOMERATE
SHALE
100% W.L.
TOP OF CONGLOMERATE
END OF UPSTREAM CURTAIN
BASE OF CONGLOMERATE
175+00
175+50
176+00
EMBANKMENT STATIONS IN FEET

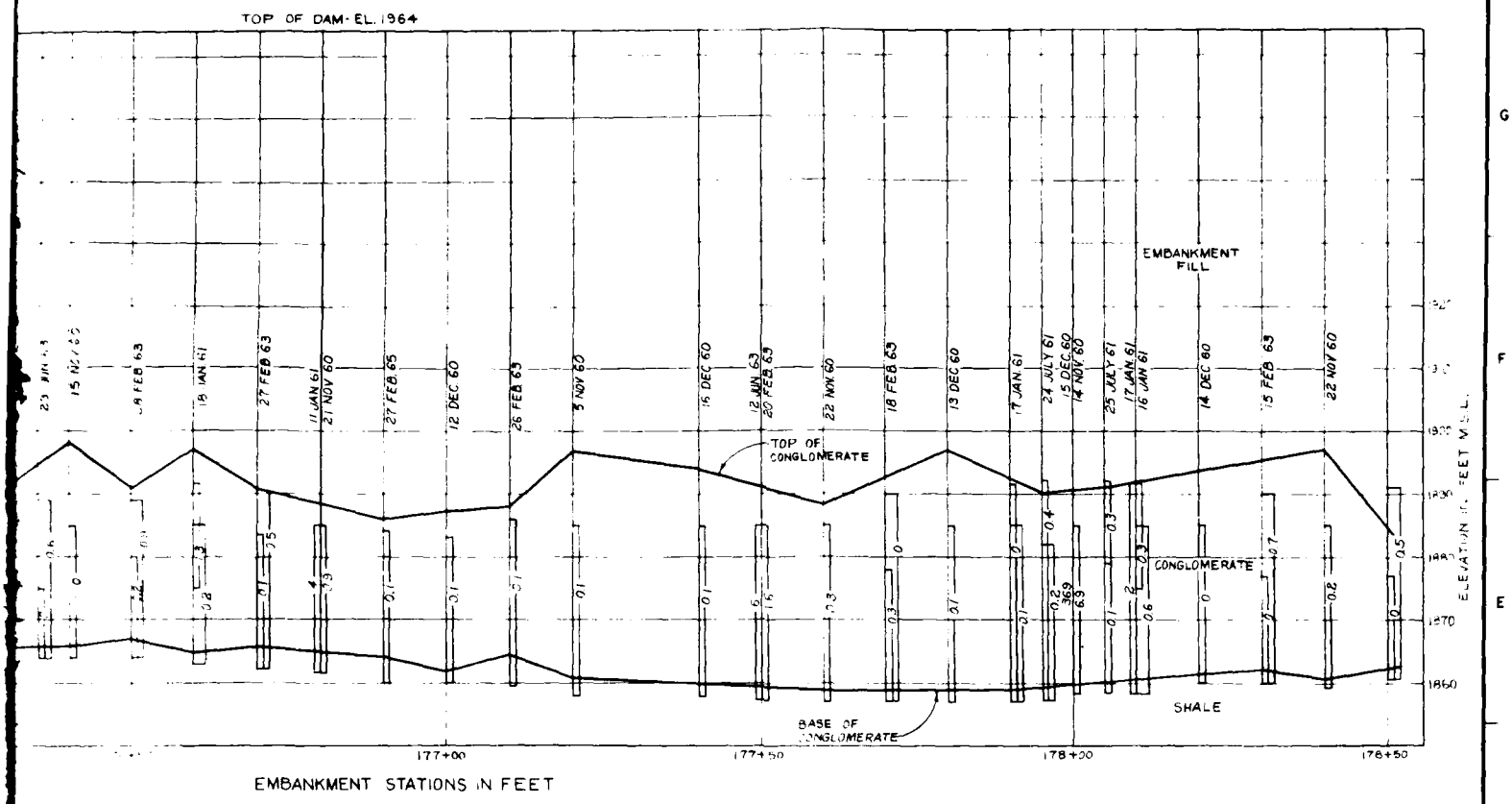


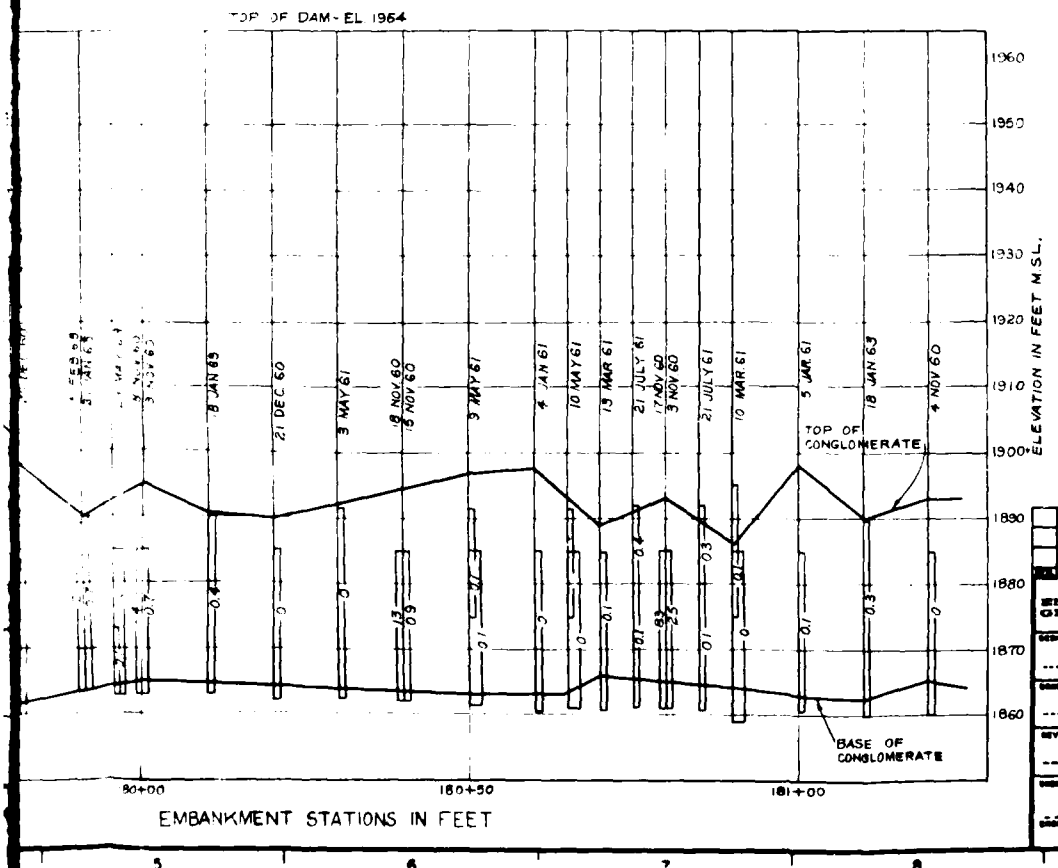


ENGINEERING DIVISION GEOTECHNICAL BRANCH	U.S. ARMY ENGINEER DISTRICT, FORT WORTH CORPS OF ENGINEERS FORT WORTH, TEXAS	
DESIGNED BY:	OC FISHER LAKE NORTH CONCHO RIVER, TEXAS	
DRAWN BY:	AS-BUILT SECTION FOUNDATION GROUTING-RIGHT ABUTME STA 174+50 TO 176+50 SCALE AS SHOWN	
REVIEWED BY:	U.S. ARMY ENGINEER DISTRICT, FORT WORTH TO ACCOMPANY FINAL FOUNDATION REPORT	
SUBMITTED BY:	SOL. NO.	DATED
ENGINEER:	CONTR. NO	
	DRAWING NUMBER PLATE 28	SHEET NO.


TOP OF DAM-EL 1964
EMBANKMENT FILL
CONGLOMERATE
SHALE
ELEVATION IN FEET MSL
175+00
175+50
176+00
176+50
EMBANKMENT STATION


TOP OF DAM - EL 1964
EMBANKMENT FILL
CONGLOMERATE
SHALE
ELEVATION IN FEET MSL
178+50
179+00
179+50
180+00
EMBANKMENT STATIONS IN F





ENGINEERING DIVISION
GEOTECHNICAL BRANCH

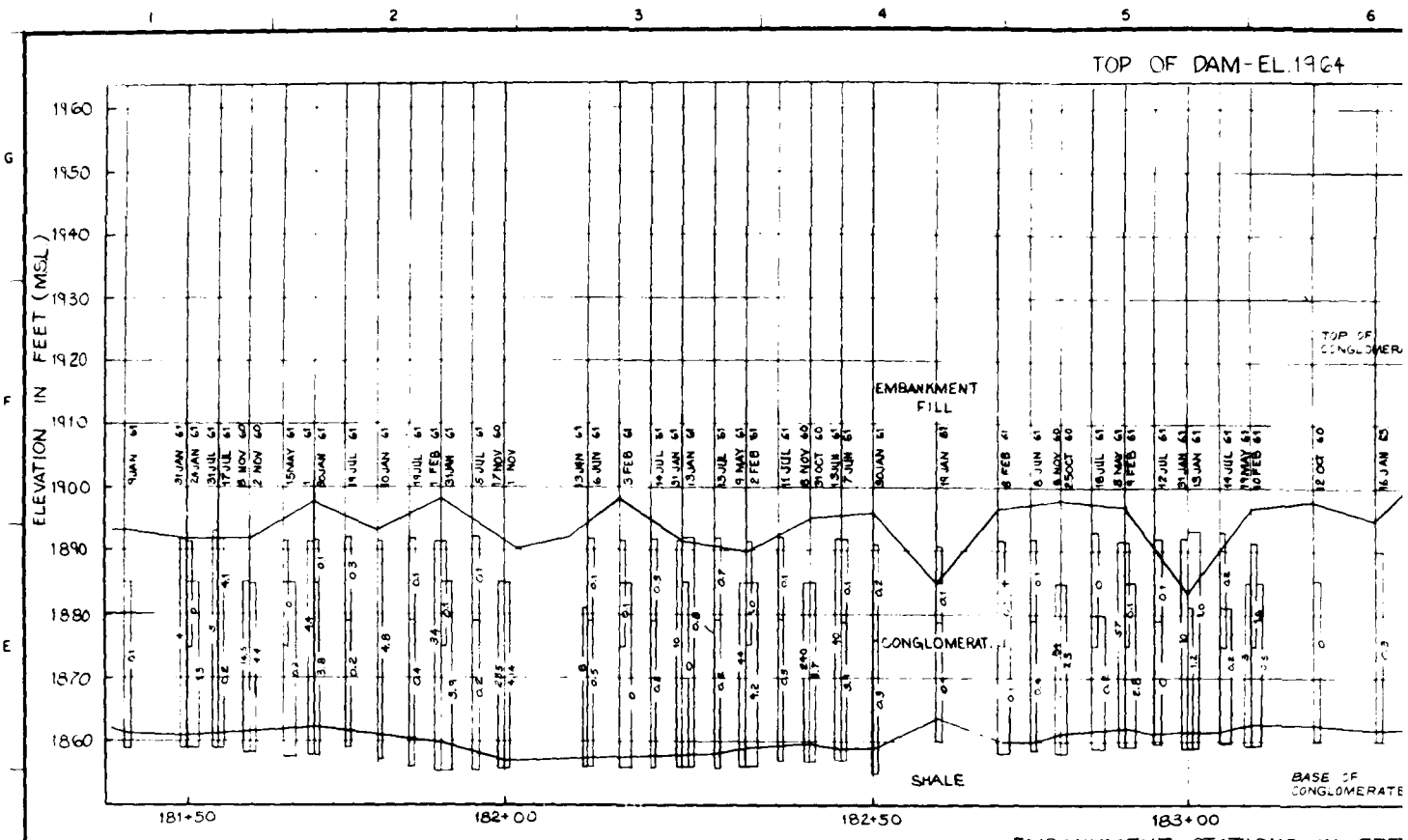
U.S. ARMY ENGINEER DISTRICT, FORT WORTH
CORPS OF ENGINEERS
FORT WORTH, TEXAS

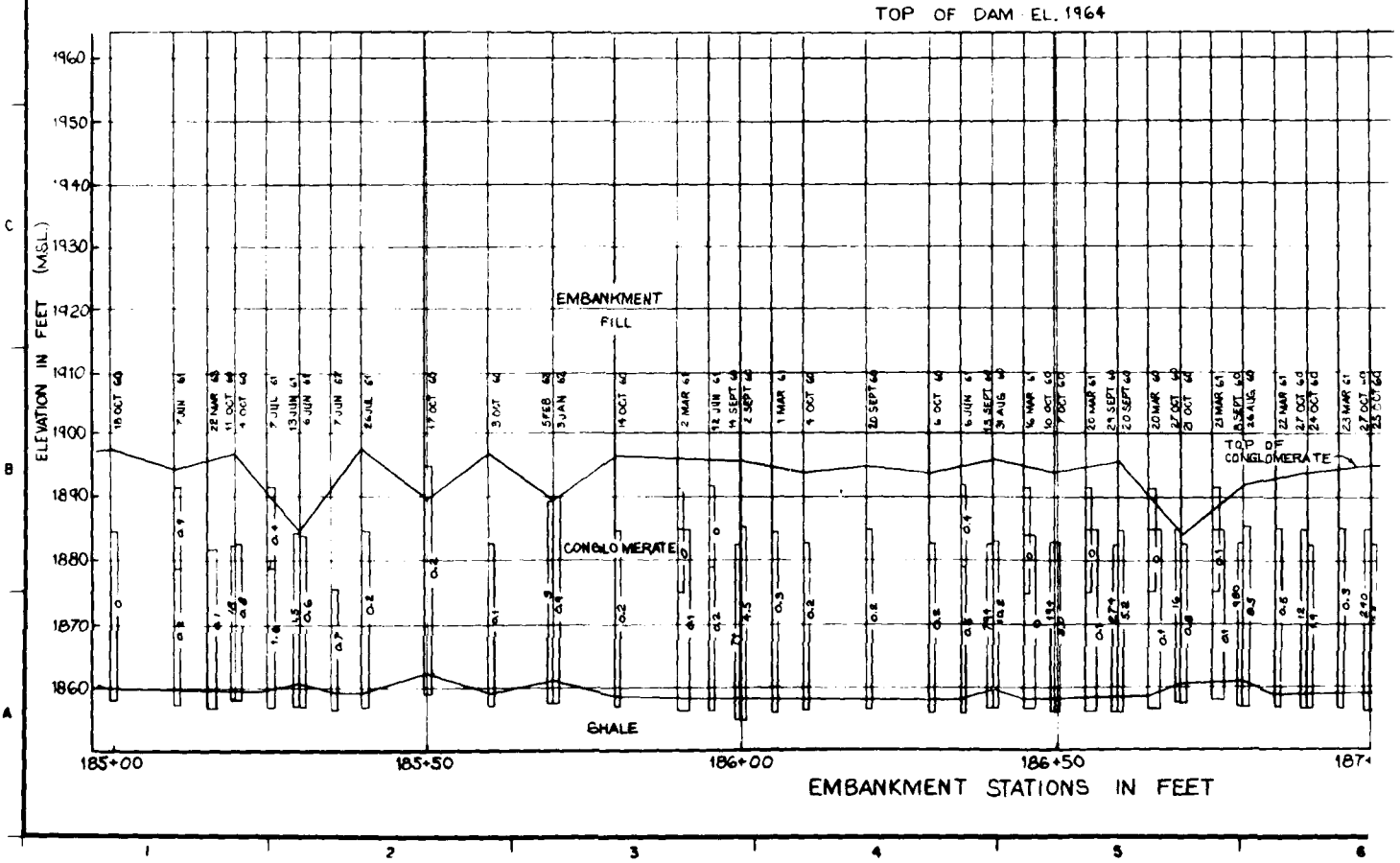
OC FISHER LAKE
NORTH CONCHO RIVER, TEXAS

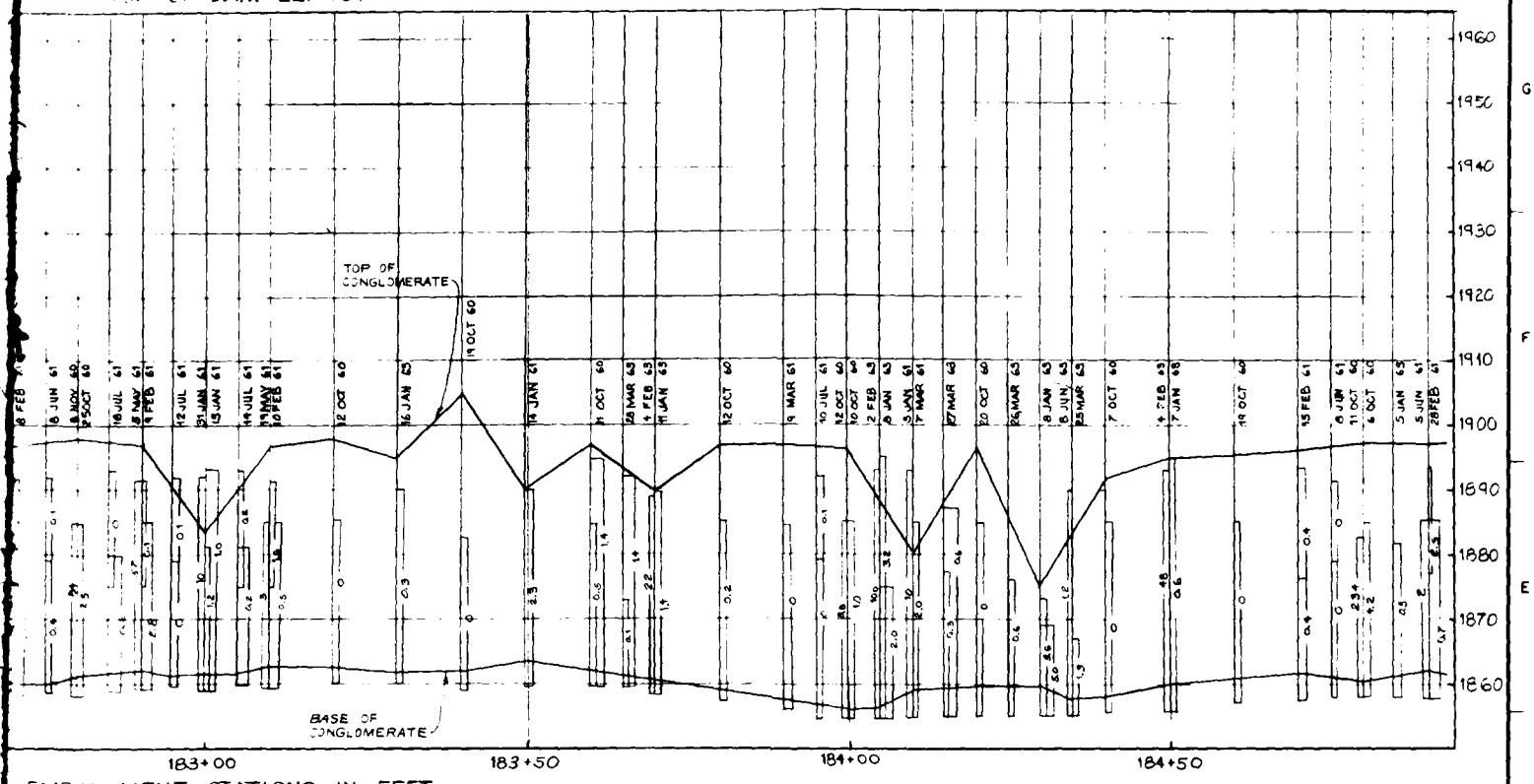
AS-BUILT SECTION
FOUNDATION GROUTING-RIGHT ABUTMENT
STA 176+50 TO 181+50
SCALE AS SHOWN

U.S. ARMY ENGINEER DISTRICT, FORT WORTH
TO ACCOMPANY FINAL FOUNDATION REPORT

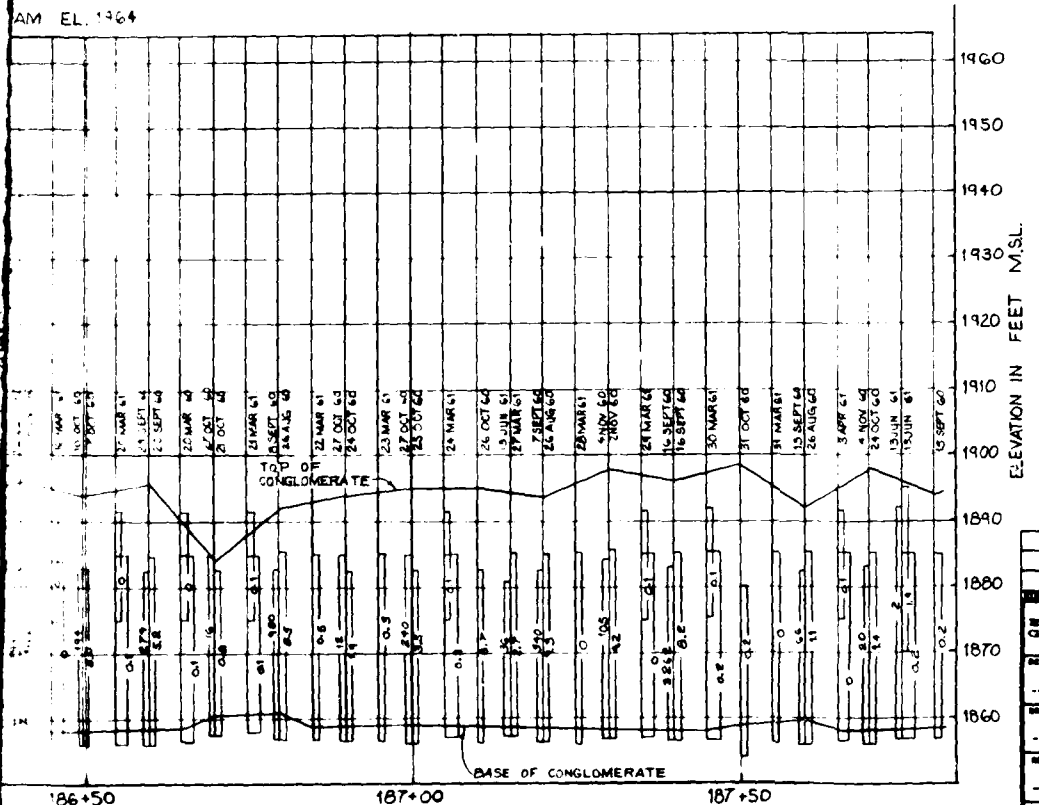
DESIGNED BY:
DRAWN BY:
REVIEWED BY:
SUBMITTED BY:
APPROVED:
SOL. NO.
DATE:
CONTR. NO.
DRAWING NUMBER
PLATE 29
SHEET NO.


TOP OF DAM-EL.1964
ELEVATION IN FEET (MSL)
1960
1950
1940
1930
1920
1910
1900
1890
1880
1870
1860
EMBANKMENT FILL
CONGLOMERATE
SHALE
TOP OF CONGLOMERATE
BASE OF CONGLOMERATE
181+50
182+00
182+50
183+00
EMBANKMENT STATIONS IN FEET


TOP OF DAM EL. 1964
ELEVATION IN FEET (MSL)
1960
1950
1940
1930
1920
1910
1900
1890
1880
1870
1860
EMBANKMENT FILL
CONGLOMERATE
SHALE
TOP OF CONGLOMERATE
185+00
185+50
186+00
186+50
EMBANKMENT STATIONS IN FEET

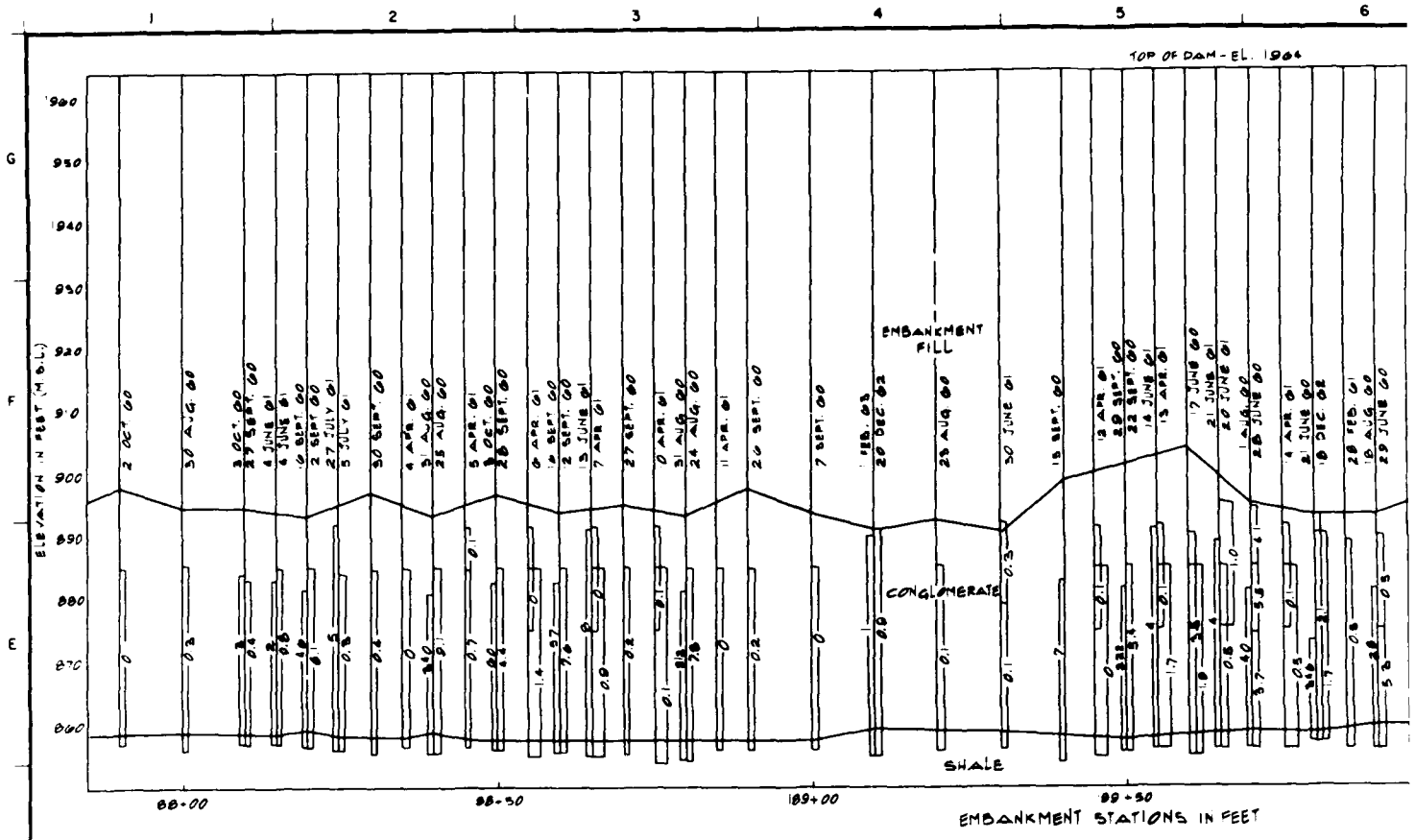


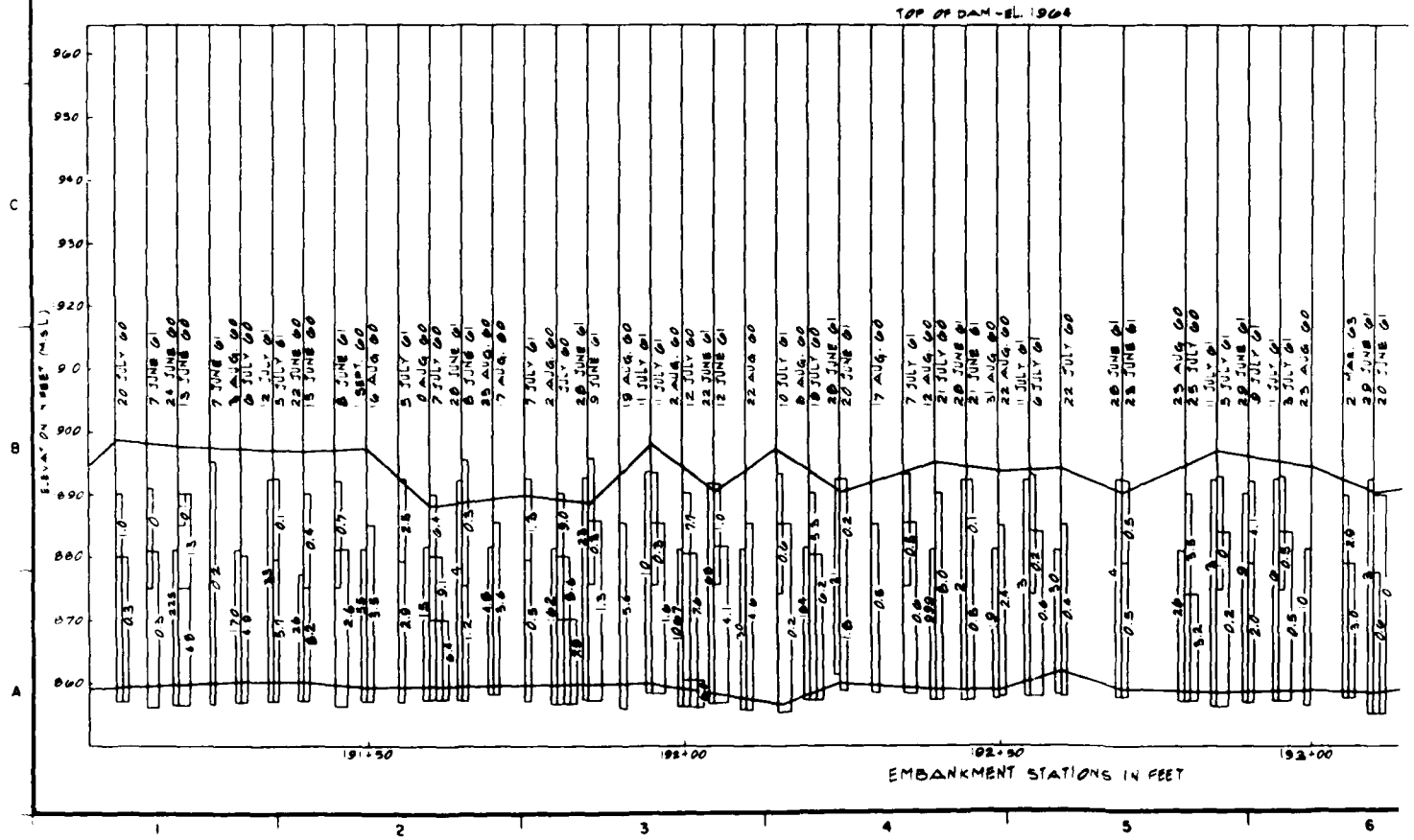
EMBANKMENT STATIONS IN FEET

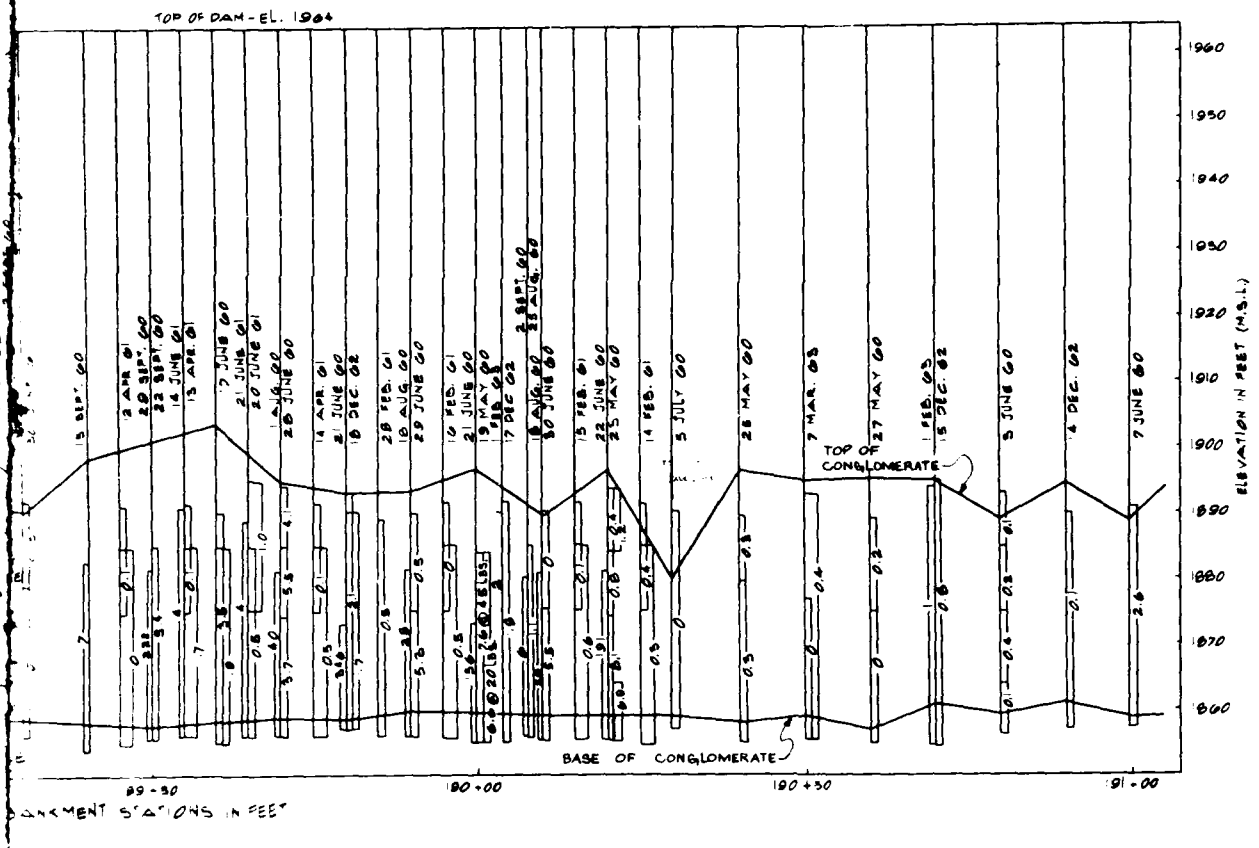


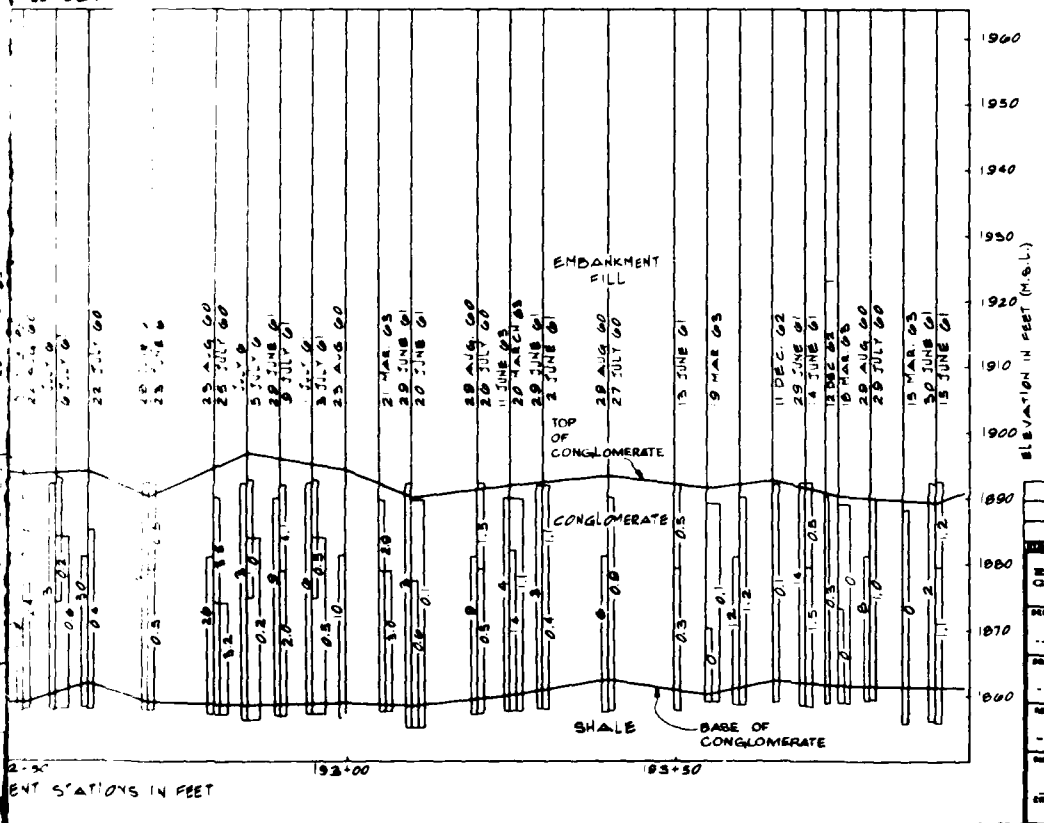
TATIONS IN FEET

ENGINEERING DIVISION GEOTECHNICAL BRANCH	U.S. ARMY ENGINEER DISTRICT, FORT WORTH CORPS OF ENGINEERS FORT WORTH, TEXAS
DESIGNED BY:	OC FISHER LAKE NORTH CONCHO RIVER, TEXAS
DRAWN BY:	AS-BUILT SECTION
CHECKED BY:	FOUNDATION GROUTING-RIGHT ABUTMENT STA 181+50 TO 187+50 SCALE AS SHOWN
REVIEWED BY:	U.S. ARMY ENGINEER DISTRICT, FORT WORTH TO ACCOMPANY FINAL FOUNDATION REPORT
SUBMITTED BY:	SOL. NO. DATED:
ENGINEER:	CONTR. NO. DRAWING NUMBER PLATE 30 SHEET NO. 27

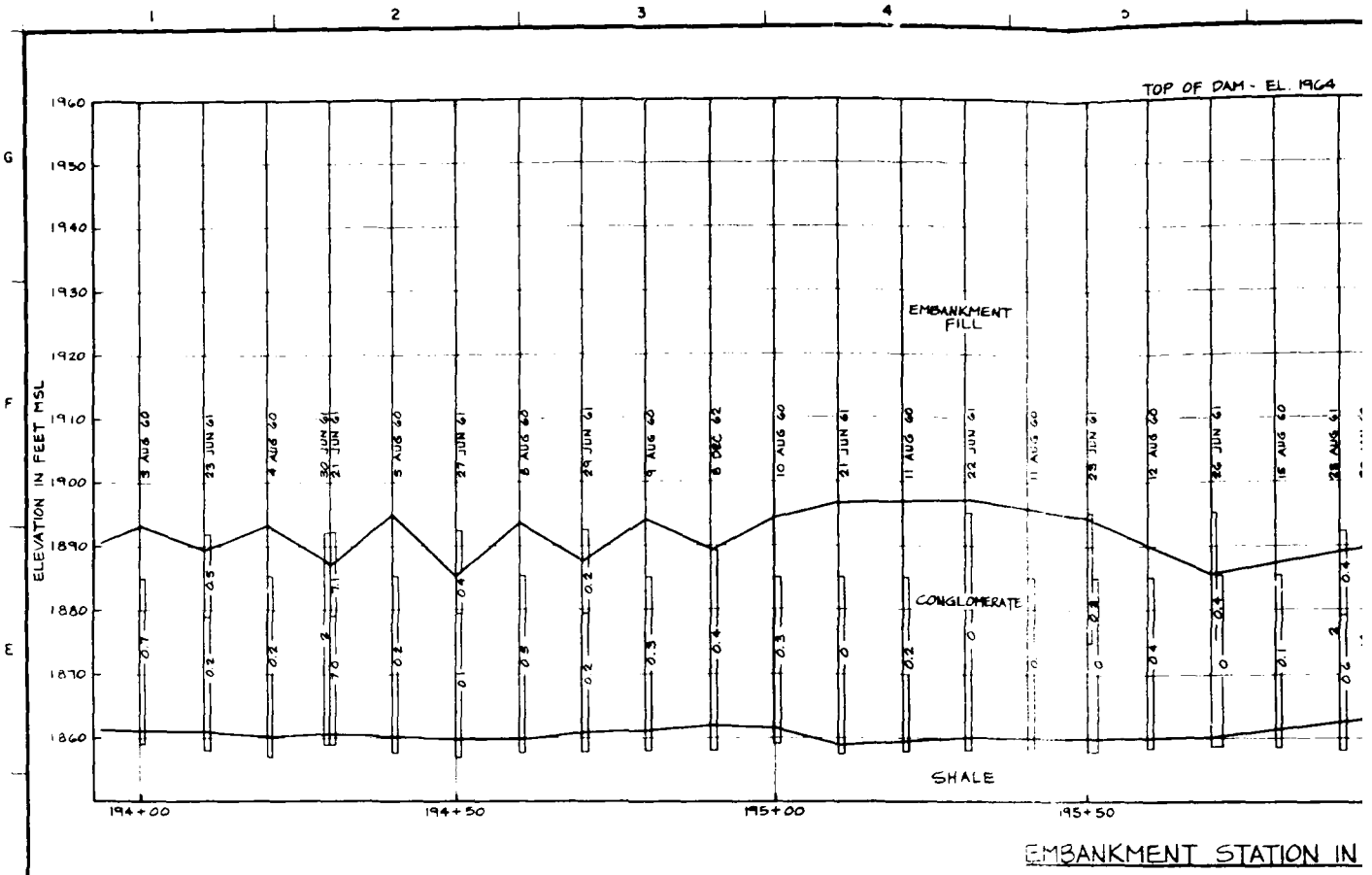

TOP OF DAM - EL. 1964
ELEVATION IN FEET (M.S.L.)
960
950
940
930
920
910
900
890
880
870
860
EMBANKMENT FILL
CONGLOMERATE
SHALE
88+00
88+50
89+00
89+50
EMBANKMENT STATIONS IN FEET


TOP OF DAM - EL. 1964
ELEVATION IN FEET (M.S.L.)
960
950
940
930
920
910
900
890
880
870
860
191+50
192+00
192+50
193+00
EMBANKMENT STATIONS IN FEET

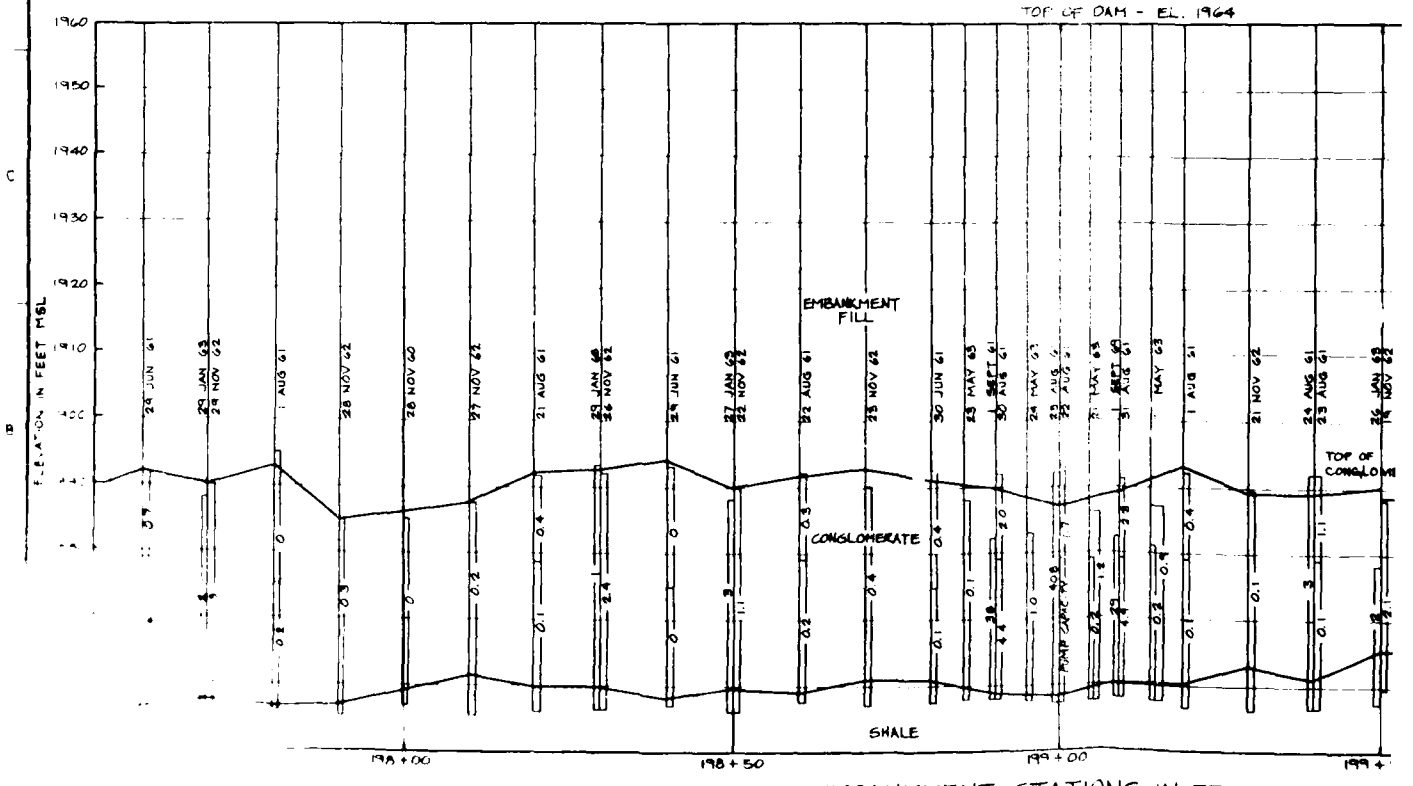




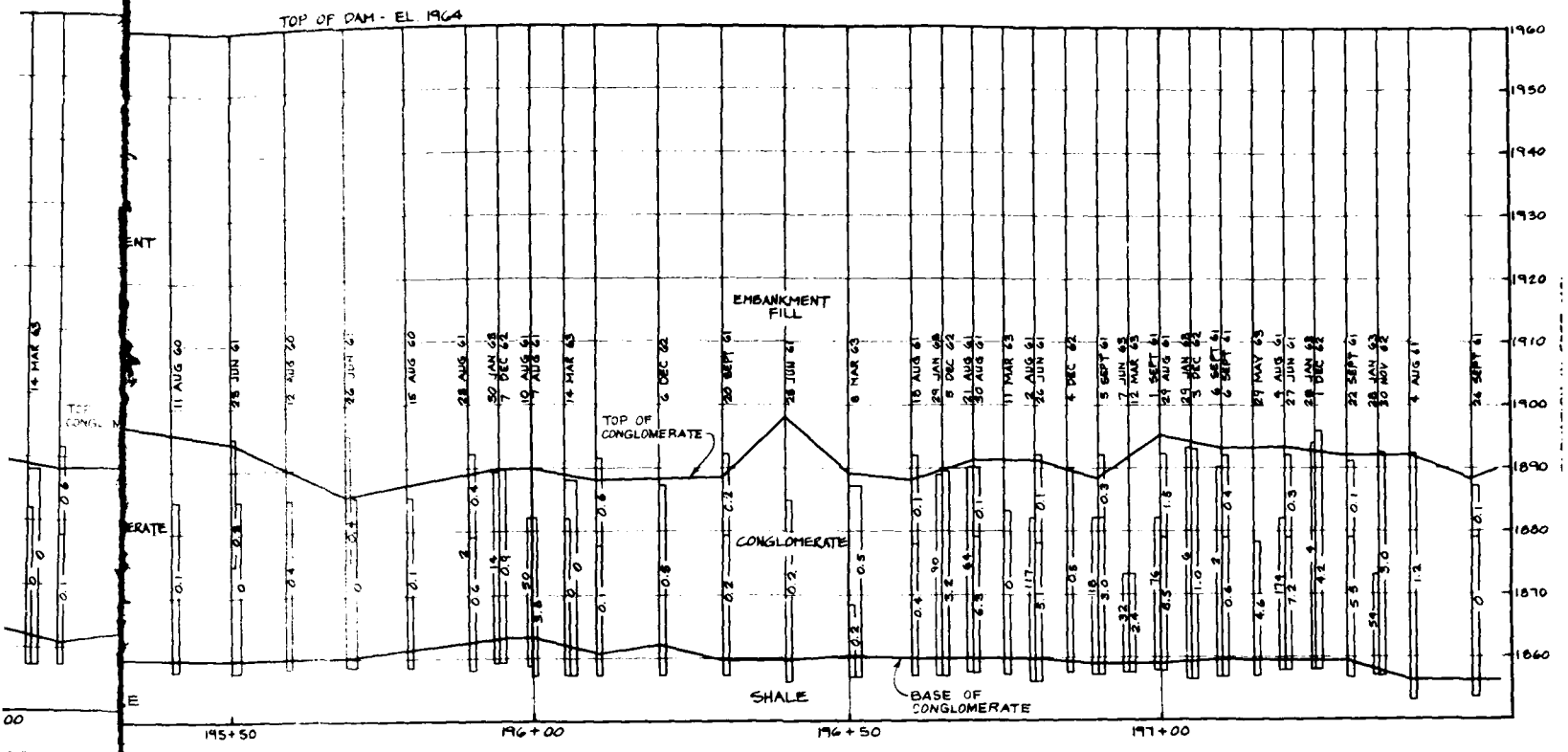
ENGINEERING DIVISION GEOTECHNICAL BRANCH		U.S. ARMY ENGINEER DISTRICT, FORT WORTH CORPS OF ENGINEERS FORT WORTH, TEXAS	
DESIGNED BY:	OC FISHER LAKE NORTH CONCHO RIVER, TEXAS		
DRAWN BY:	AS-BUILT SECTION		
CHECKED BY:	FOUNDATION GROUTING-RIGHT ABUTMENT STA. 188+00 TO 193+50 SCALE AS SHOWN		
SUBMITTED BY:	U.S. ARMY ENGINEER DISTRICT, FORT WORTH TO ACCOMPANY FINAL FOUNDATION REPORT		
ENGINEER:		SOL. NO.	DATED:
		CONTR. NO.	
		DRAWING NUMBER PLATE 31	SHEET NO. OF



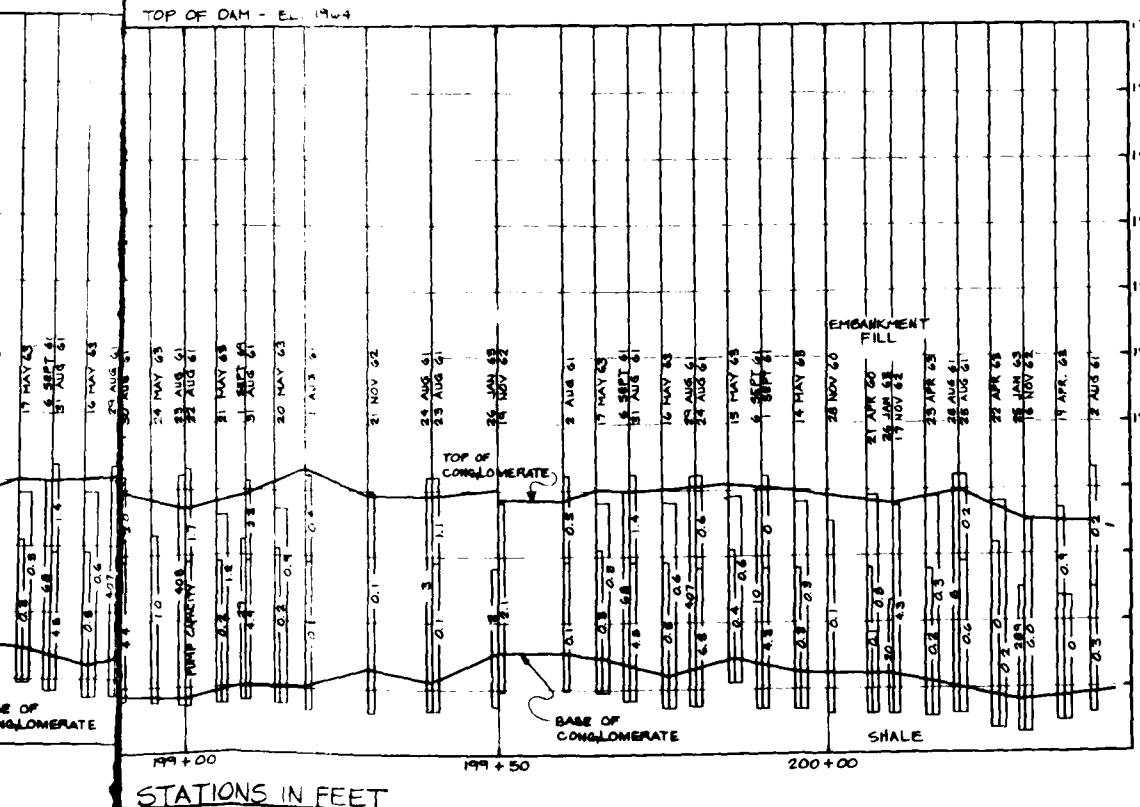
EMBANKMENT STATION IN



EMBANKMENT STATIONS IN FEET



EMBANKMENT STATION IN FEET



STATIONS IN FEET

ENGINEERING DIVISION
GEOTECHNICAL BRANCH

U.S. ARMY ENGINEER DISTRICT, FORT WORTH
CORPS OF ENGINEERS
FORT WORTH, TEXAS

DESIGNED BY:
DRAWN BY:
REVIEWED BY:
SUBMITTED BY:
ENGINEER:

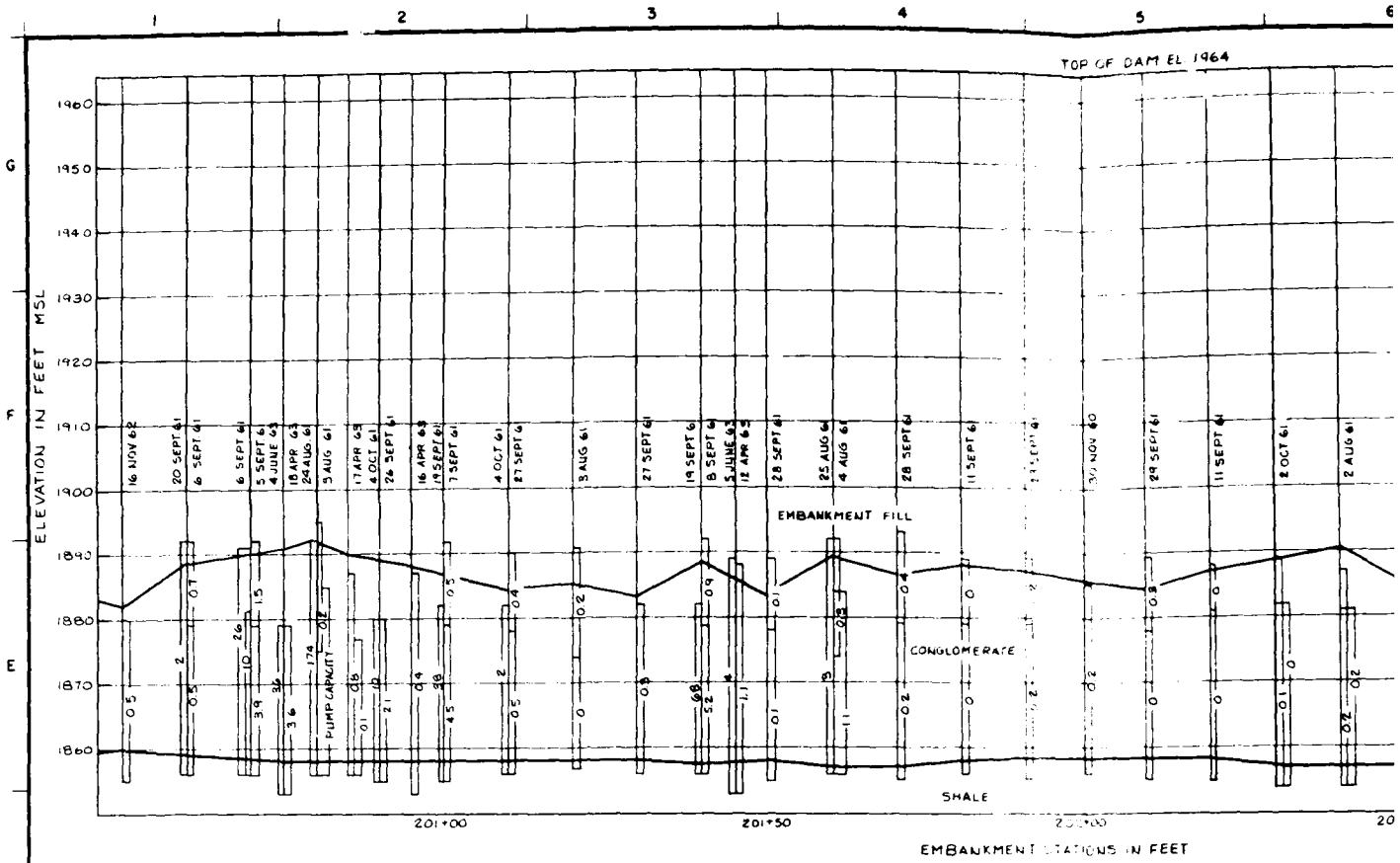
OC FISHER LAKE
NORTH CONCHO RIVER, TEXAS

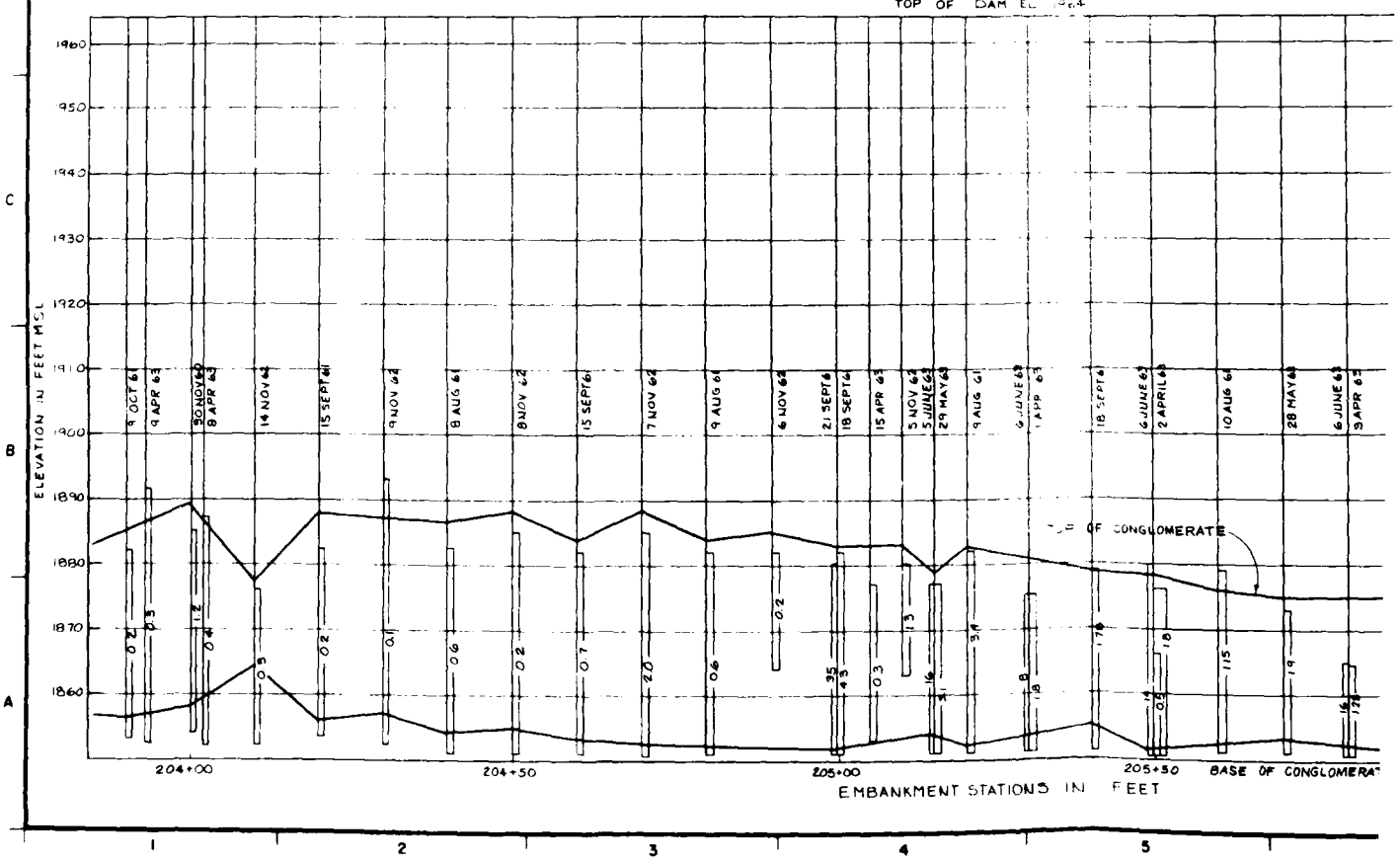
AS-BUILT SECTION

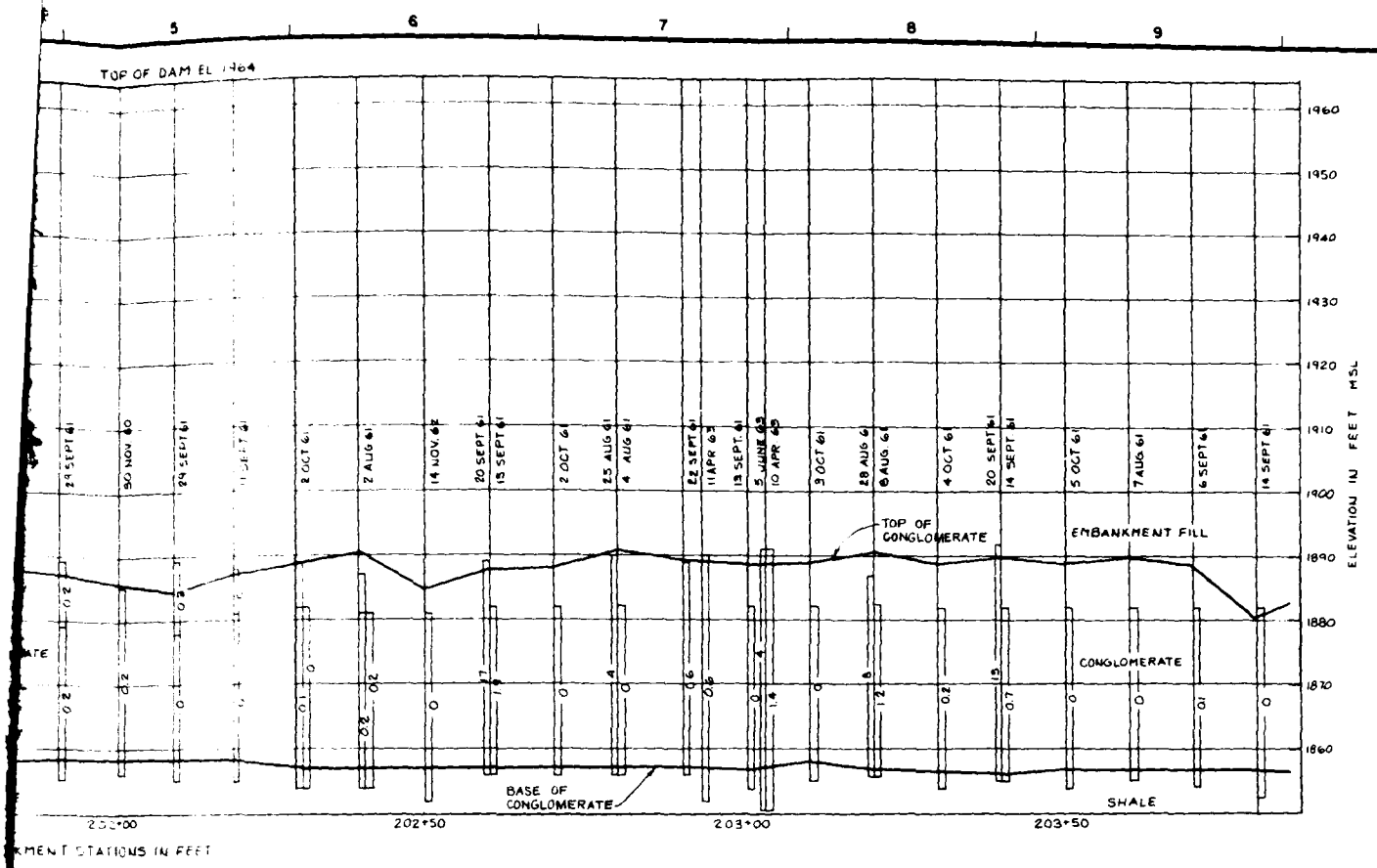
FOUNDATION GROUTING-RIGHT ABUTME
STA 194+00 TO 200+50
SCALE AS SHOWN

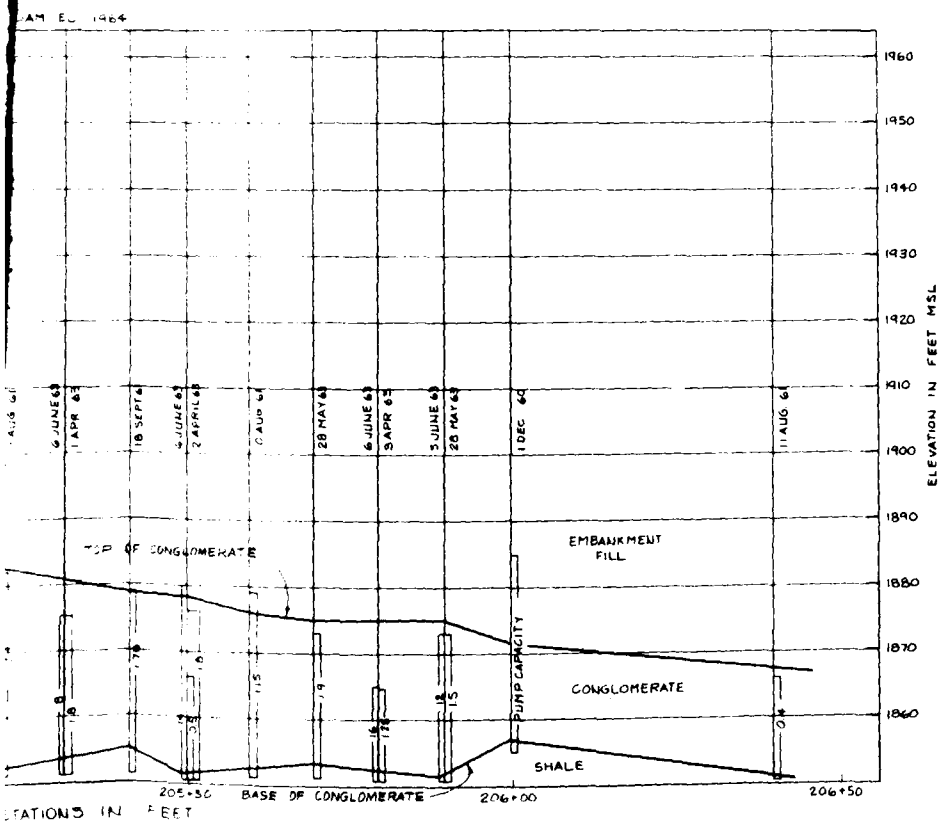
U.S. ARMY ENGINEER DISTRICT, FORT WORTH
TO ACCOMPANY FINAL FOUNDATION REPORT

SOL. NO.
DATED:
CONTR. NO.
DRAWING NUMBER
PLATE 32
SHEET NO.
OF


TOP OF DAM EL 1964
ELEVATION IN FEET MSL
EMBANKMENT FILL
CONGLOMERATE
SHALE
PUMP CAPACITY
201+00
201+50
EMBANKMENT STATIONS IN FEET


TOP OF DAM EL 1964
ELEVATION IN FEET MSL
TOP OF CONGLOMERATE
204+00
204+50
205+00
205+50
EMBANKMENT STATIONS IN FEET





ENGINEERING DIVISION
GEOTECHNICAL BRANCH

U.S. ARMY ENGINEER DISTRICT, FORT WORTH
CORPS OF ENGINEERS
FORT WORTH, TEXAS

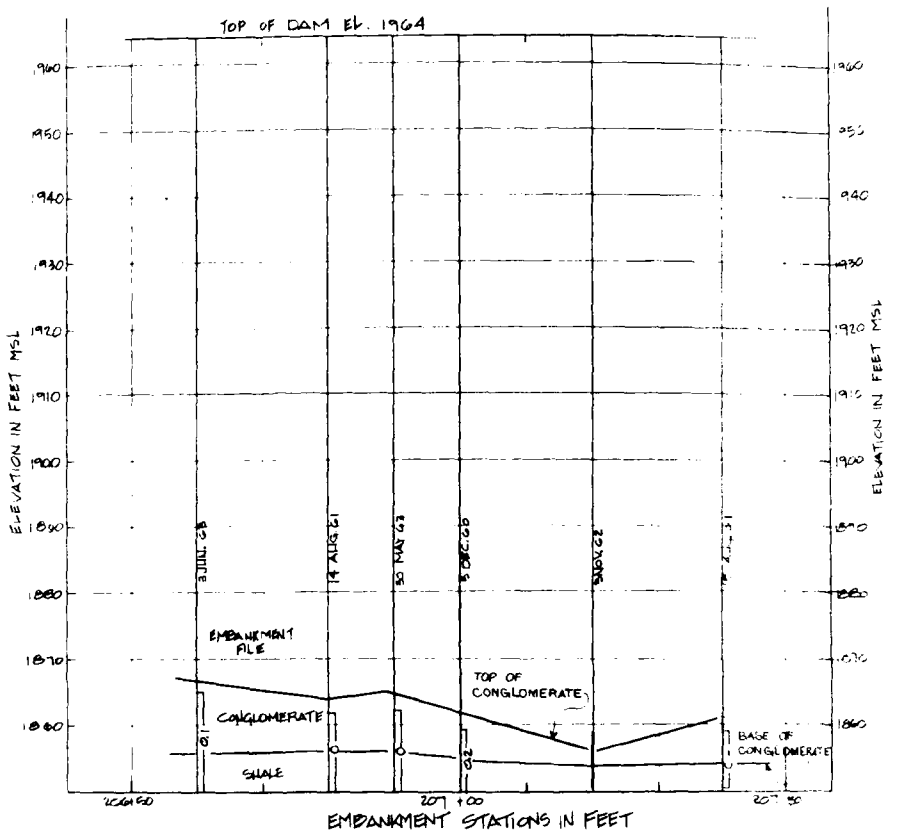
OC FISHER LAKE
NORTH CONCHO RIVER, TEXAS

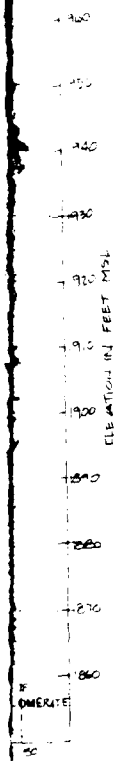
AS-BUILT SECTION

FOUNDATION GROUTING-RIGHT ABUTM
STA 200+50 TO 206+50
SCALE AS SHOWN

U.S. ARMY ENGINEER DISTRICT, FORT WORTH
TO ACCOMPANY FINAL FOUNDATION REPORT

DESIGNED BY:
DRAWN BY:
REVIEWED BY
SUBMITTED BY:
ENGINEER:
SOL. NO.
DATED:
CONTR NO
DRAWING NUMBER
PLATE 33
SHEET NO.
OF

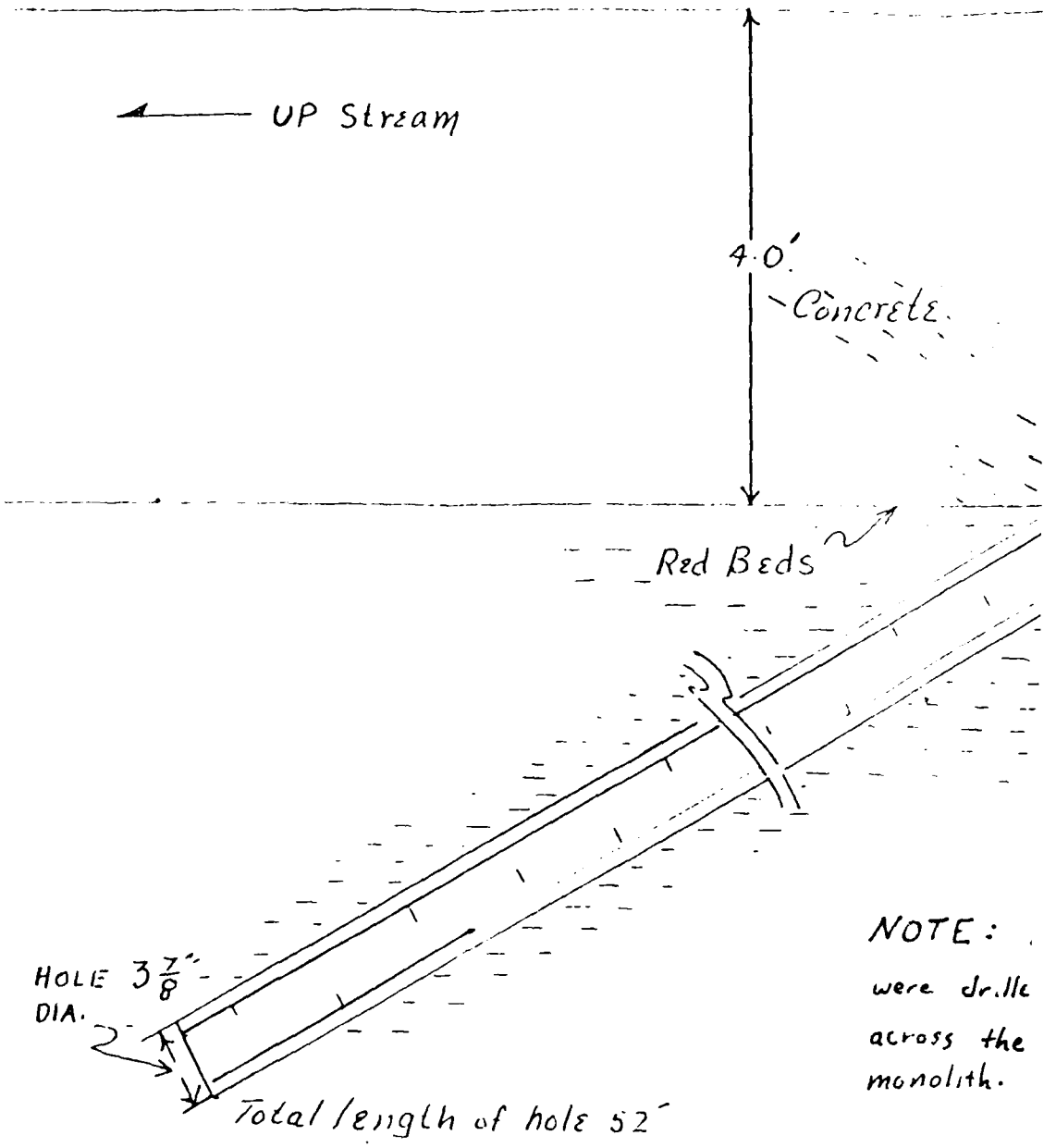

TOP OF DAM EL. 1964
1960
1950
1940
1930
1920
1910
1900
1890
1880
1870
1860
ELEVATION IN FEET MSL
EMBANKMENT FILE
TOP OF CONGLOMERATE
CONGLOMERATE
SHALE
BASE OF CONGLOMERATE
EMBANKMENT STATIONS IN FEET



ENGINEERING DIVISION GEOTECHNICAL BRANCH	U.S. ARMY ENGINEER DISTRICT, FORT WORTH CORPS OF ENGINEERS FORT WORTH, TEXAS
DESIGNED BY: DRAWN BY: REVIEWED BY:	O.C. FISHER LAKE NORTH CONCHO RIVER, TEXAS AS-BUILT SECTION FOUNDATION GROUTING-RIGHT ABUTMENT STA 206+50 TO 207+50 SCALE AS SHOWN U.S. ARMY ENGINEER DISTRICT, FORT WORTH TO ACCOMPANY FINAL FOUNDATION REPORT
SUBMITTED BY: CHIEF:	SOL NO. DATED: CONTR. NO. DRAWING NUMBER: PLATE 34 SHEET NO. OF

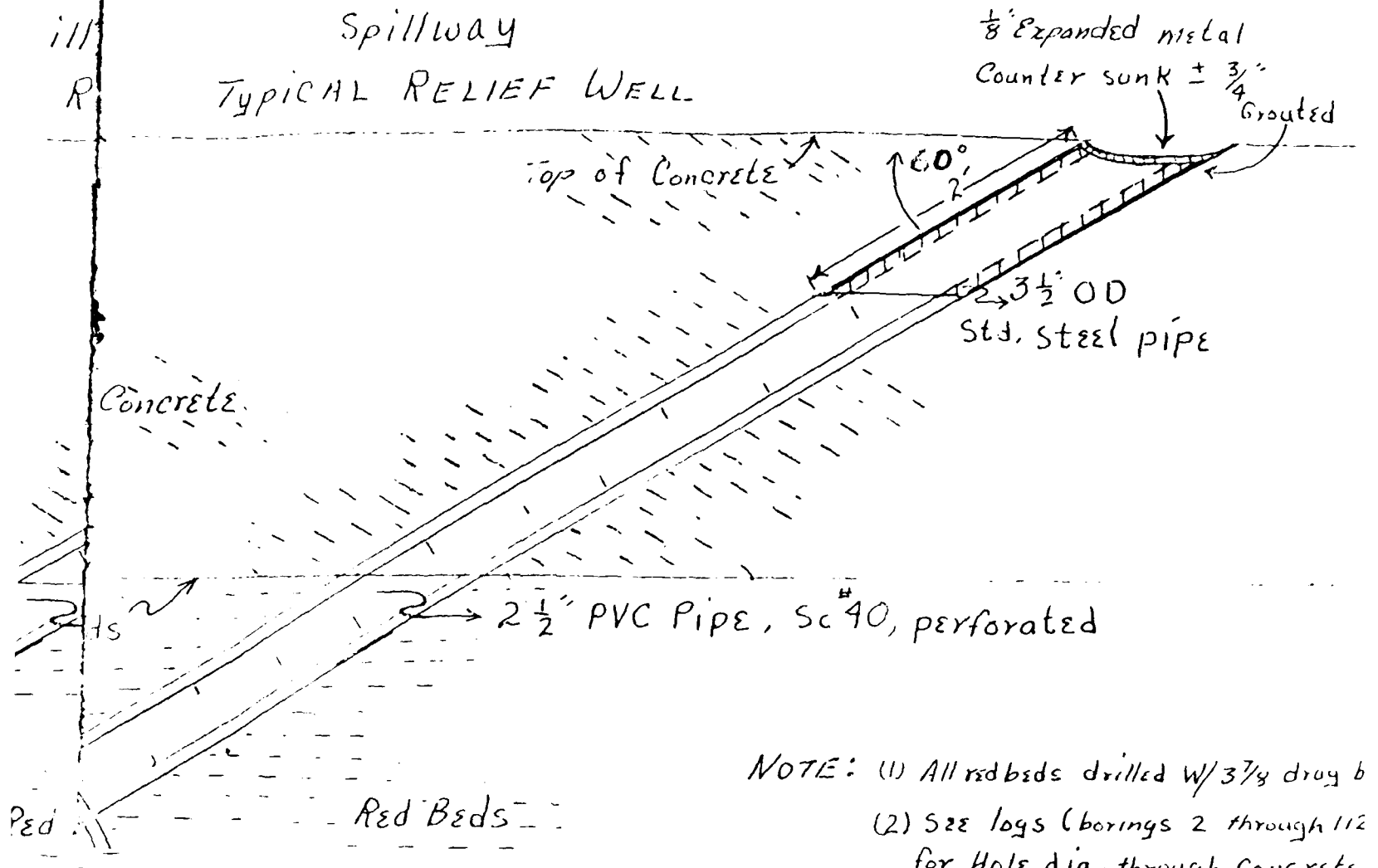
O.C. Fi

Typic.



NOTE:
were dr.lle
across the
monolith.

O.C. FISHER DAM & LAKE
Spillway
TYPICAL RELIEF WELL



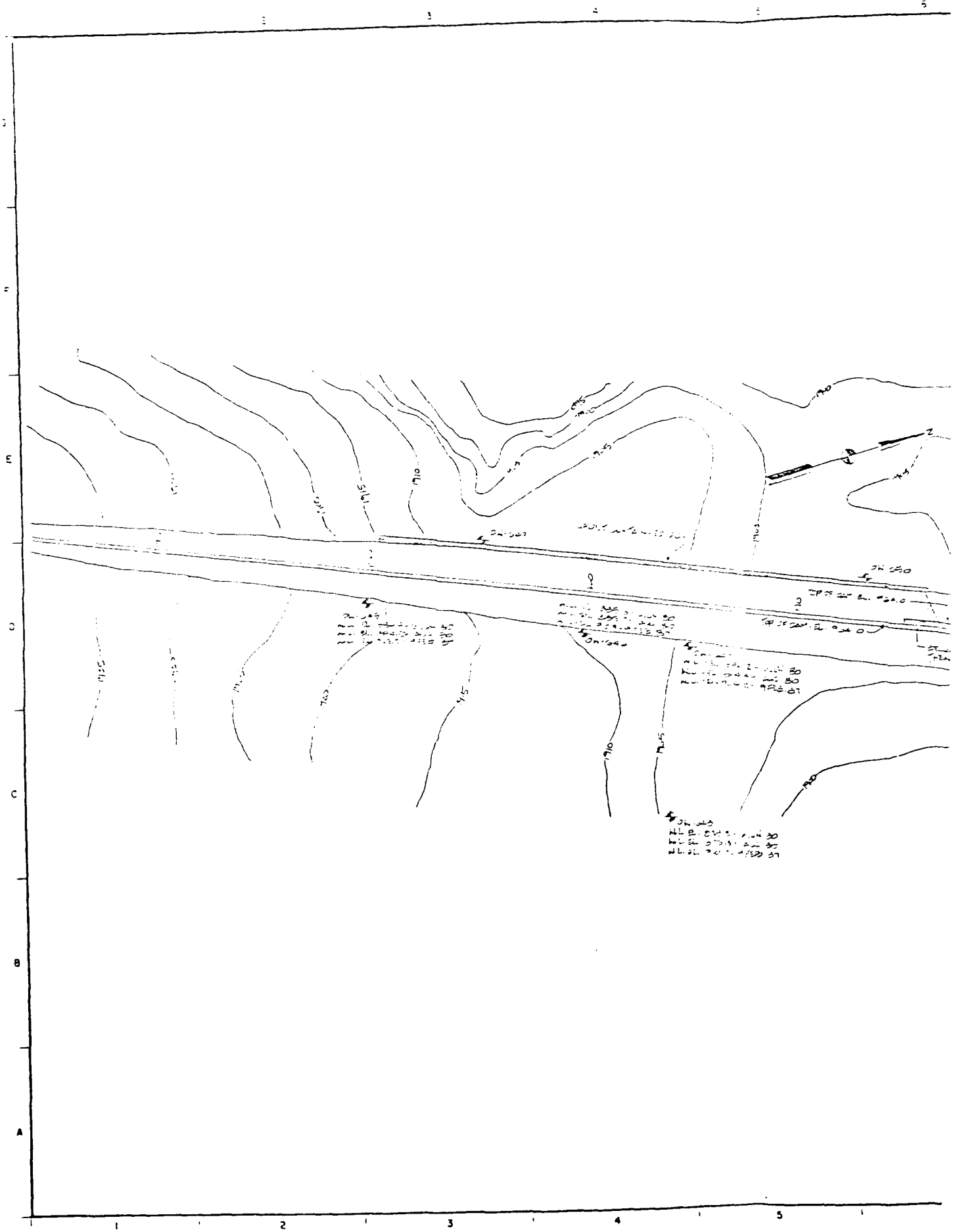
NOTE: (1) All red beds drilled W/ 3⅞ drag b
(2) See logs (borings 2 through 112
for Hole dia. through Concrete

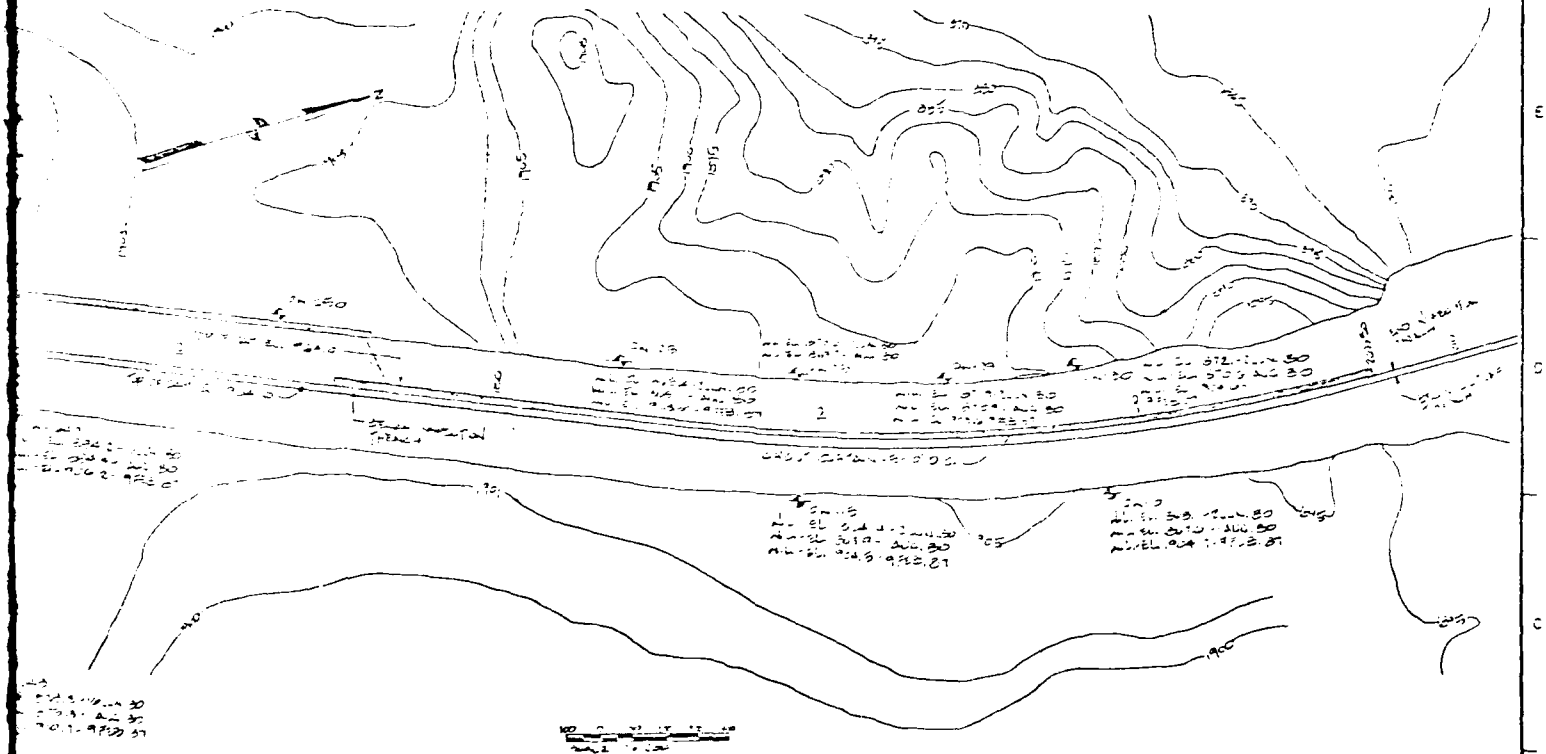
NOTE: 110 Pressure Relief Wells were drilled centered 10 feet apart across the full width of the wier monolith.

LEGEND
Not to Scale

SEP 1979
L. COLE

PLATE 35





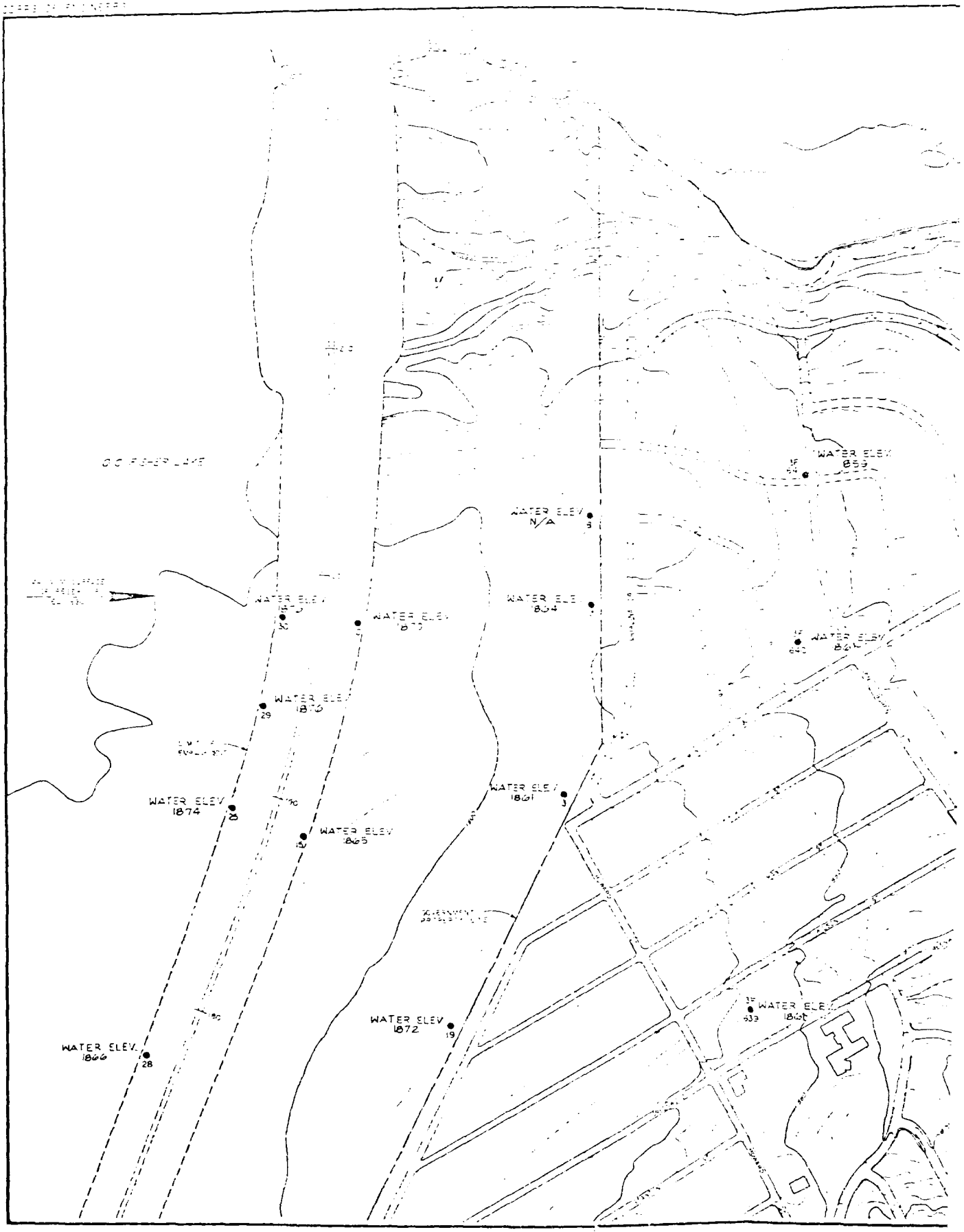
U.S. ARMY ENGINEER DISTRICT, FORT WORTH
CORPS OF ENGINEERS
FORT WORTH, TEXAS

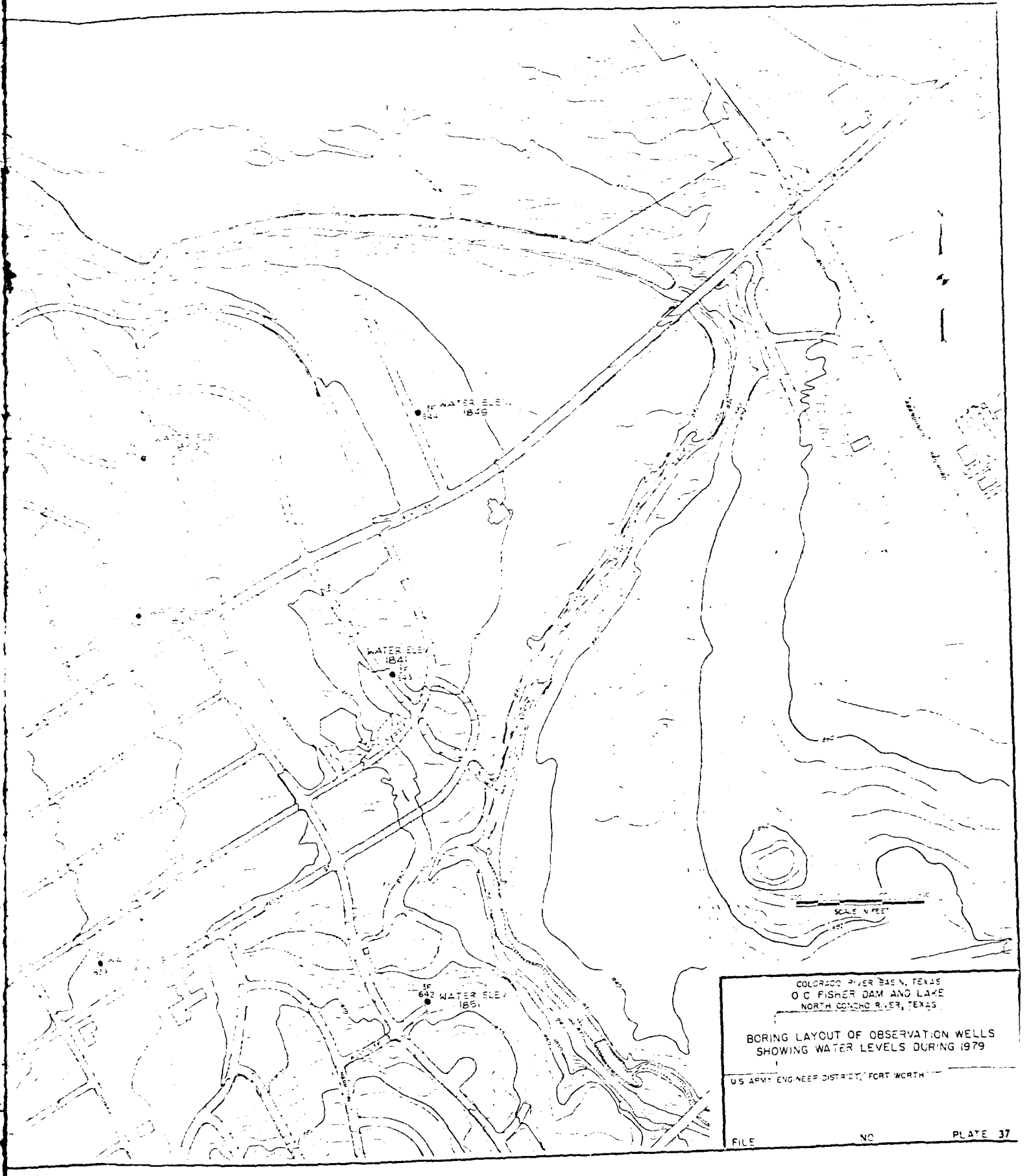
COLORADO RIVER BASIN, TEXAS
O C FISHER DAM
NORTH CONCHO RIVER, TEXAS

FOUNDATION GROUTING AND OBSERVATION WELL WATER LEVELS ALONG THE RIGHT ABUTMENT

DESIGNED BY
DRAWN BY
CHECKED BY
SUBMITTED BY
ENGINEER
SOL NO
DATED
CONTR NO
DRAWING NUMBER
SHEET NO
SEQUENCE NO

PLATE 36


O C FISHER LAKE
WATER ELEV
1870
30
WATER ELEV
1870
WATER ELEV
1870
29
WATER ELEV
1874
28
WATER ELEV
1865
WATER ELEV
N/A
WATER ELEV
1864
WATER ELEV
1861
3
WATER ELEV
1872
19
WATER ELEV
1866
28
WATER ELEV
859
WATER ELEV
1861



COLORADO RIVER BASIN, TEXAS
O C FISHER DAM AND LAKE
NORTH CONCHO RIVER, TEXAS

BORING LAYOUT OF OBSERVATION WELLS
SHOWING WATER LEVELS DURING 1979

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

FILE NO PLATE 37


DATE
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